APRIL 1954

APPLIED HYDRAULICS

THE MAGAZINE OF FLUID POWER TRANSMISSION

INCLUDING AIR CONTROLS AND AIR CIRCUIT DESIGN; ELECTRICAL CONTROLS

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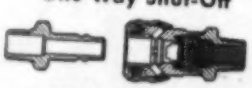

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All communications should be addressed to APPLIED HYDRAULICS, 1240 Ontario St., Cleveland 13, Ohio. Phone SUperior 1-9422.

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PNEUMATICS - HYDRAULICS - ELECTRICAL CONTROLS

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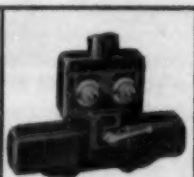

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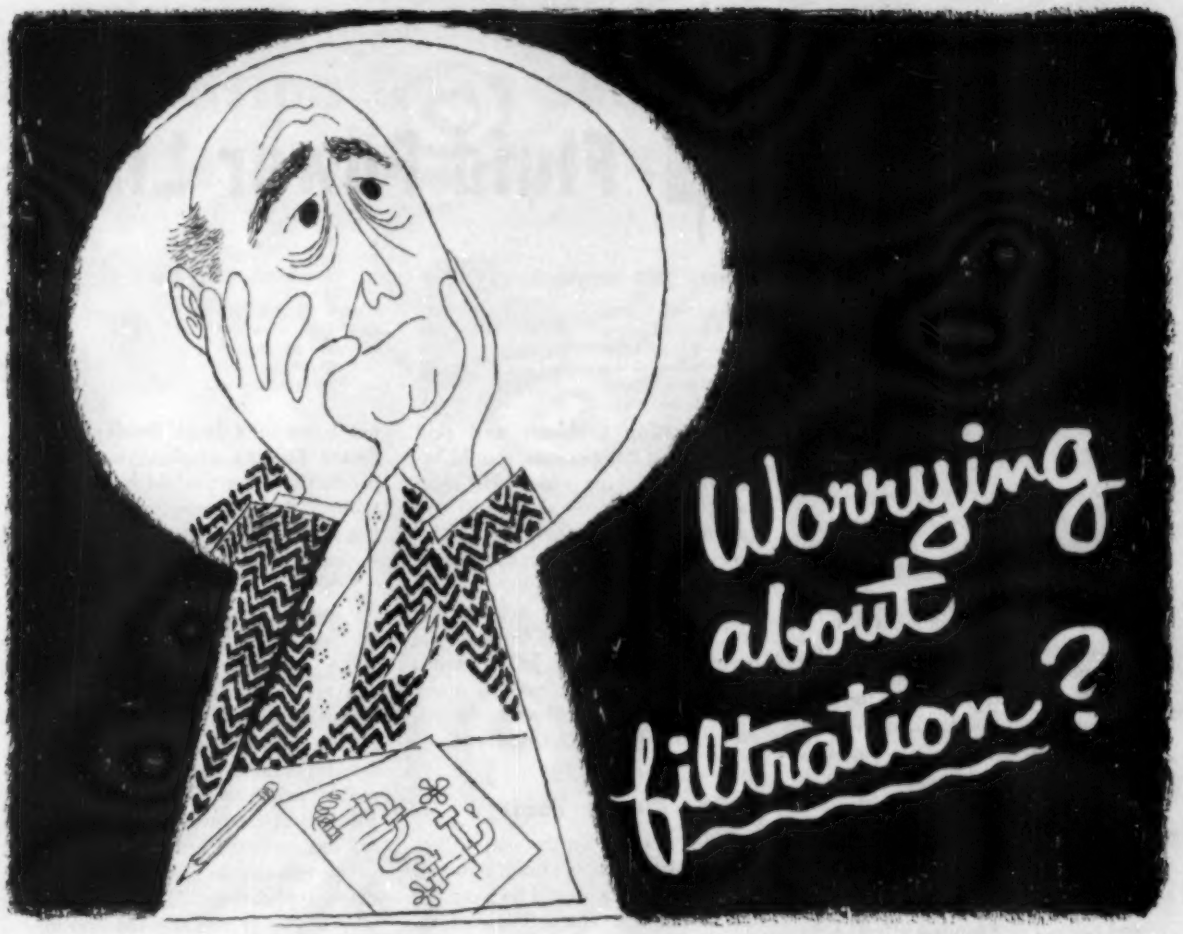

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APPLIED HYDRAULICS

Fluid Power Lines

Fluid Power for Better Tooling

When planning the editorial content of this issue our desire was to provide you with many tooling ideas which use fluid power. As a result, the range of articles this month describes tools for brazing, for moving materials, for machining, for press work and for product assembly. We have two reasons for concentrating on tooling this month. One is the ASTE show being held during the week of April 26th in Philadelphia. The other is the "buyer's" market which many industries must meet for the first time in over ten years. To sell in this market will require emphasis on quality and price. Plant tooling affects both. You'll find that fluid power, applied to tooling, gets work done faster, often with lower tooling costs and always with less effort from the operator.

Problem Clinic

This month, over toward the back of the magazine you'll find an article which is the result of correspondence from a reader. As the problem relates to a rod bending operation, it is common to many applications. Its solution involved an understanding of basic circuits and a knowledge of available valving.

If you have similar problems which have been solved or are looking for a solution, we hope you'll send them to us.

Safe Operation of Tools

How much can you spend for safety? There is a limit. However, price alone will not make your tooling safe. Ingenuity, awareness of the operating problems and skill in selecting components should result in a machine which will meet the production requirements and operate with little possibility of injury to the operator or damage to the work and equipment.

In Harry Stewart's article, several typical hydraulic installations designed with safety in mind are detailed. They will give you many ideas to help you outsmart the operator and prevent an accident.

Pierce Tools

If we were to list the major general applications of fluid powered tooling, piercing would be near the top of our list. The article describing the piercing machine used to put holes in a large floodlight reflector housing emphasizes greater production over the old horn press tooling. Another aspect to this tooling is the cost as compared to a set-up on a standard press.

When To Use Fluid Motors

Frank Zagar describes an application of a fluid motor for driving boring tools. It's not a common use for fluid motors because electric motor drives can usually do this job better. However, the fluid motor has certain features which may prove valuable in some tool spindle drive applications. The article tells why the drive was selected and under what conditions it will pay.

"The Power Behind Industry"

Imprinted on the John Spotton Co., Ltd. letterhead you'll see "Compressed Air—The Power Behind Industry". Andy Damer's article of an installation at Canada G. E. is an example of the many air powered jobs carried through by the Spotton organization. Andy is one of the sales engineers with this Toronto company which supplies both air and hydraulic components to industries in Ontario. His selling job often requires coming up with tailor-made circuits such as the one described in his article.

Andy joined the rapidly expanding Spotton organization shortly after the war. He had met John Spotton, then Major Spotton, during the war. Andy believes that John thought of him after the war

Andrew M. Damer

because it had become a habit to think of Damer when posting a duty roster.

Last year John Spotton Co., Ltd. moved into new modern quarters at 21 Carson Street in Toronto. This move has given them greater space to stock components for supplying "The Power Behind Industry" to Ontario plants.

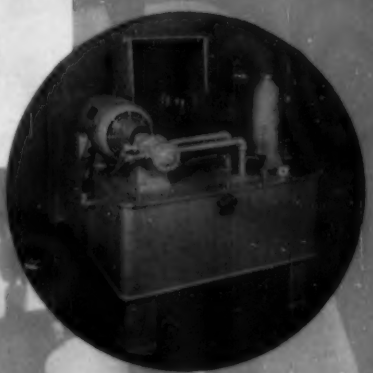
Precision Dyna-seals solve plug sealing problems on NATCO HOLEPAK

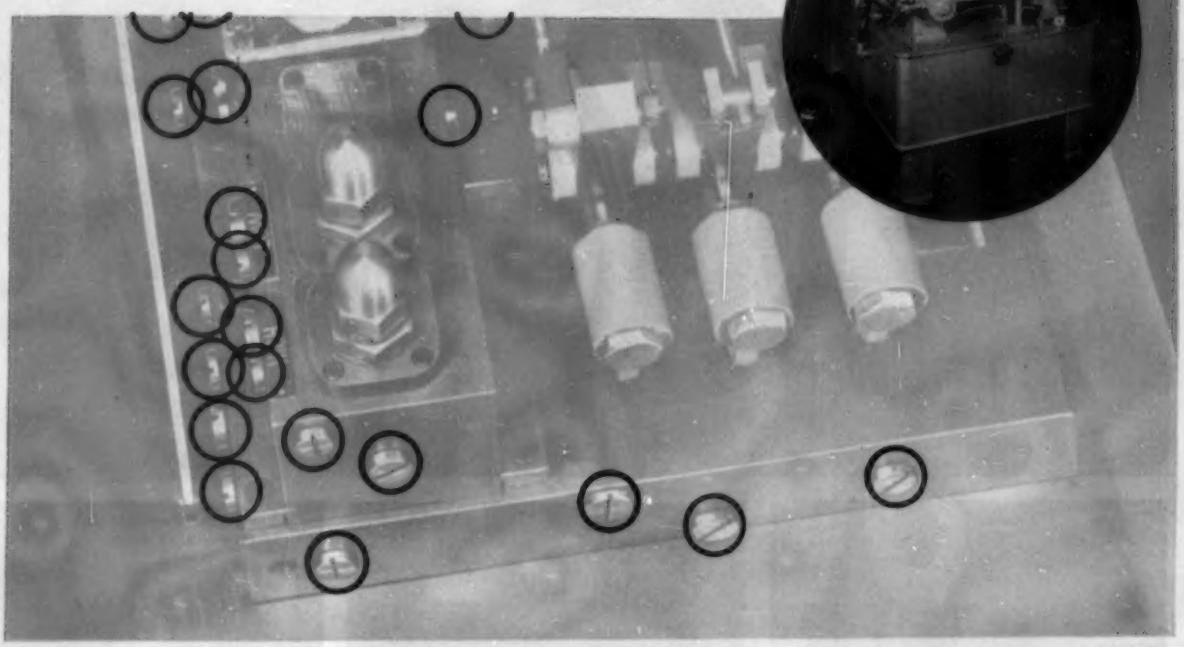
old plug design—

used an "O" Ring in a groove. Plugs were expensive, required close tolerances, permitted leakage.

improved plug design—

uses Precision Dyna-seals. Plugs are inexpensive, tolerances not critical. Assembly is much simpler, leakage eliminated.





National Automatic Tool Company, Inc. found *Precision Dyna-seals* the perfect answer to plug-leakage problems on their "Holepak" Hydraulic Control Units. There are now more than 30 *Dyna-seals* on units like the one shown here!

NATCO's improved design employing *Dyna-seals* has lowered the cost of the plugs—reduced installation and maintenance time—and completely eliminated leakage.

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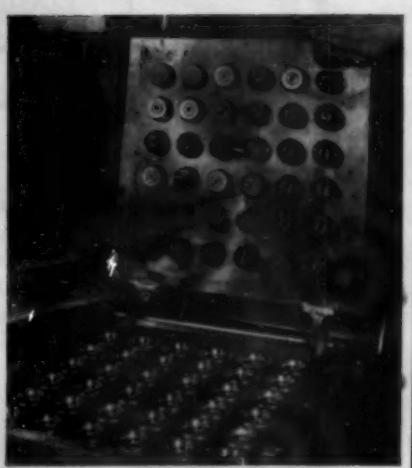

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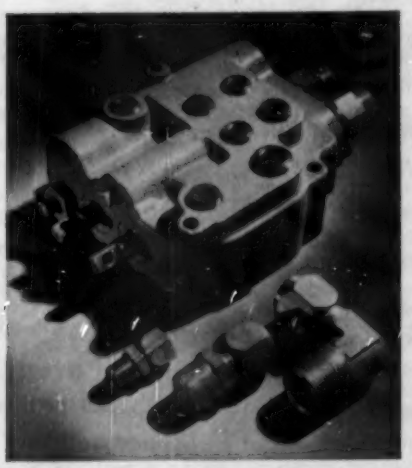
5. Get complete data in Catalog No. 5100. Ask your Parker representative or mail the coupon for a copy. Then, compare actual sample O-rings.



6. What other Parker products for *hydraulic* and *fluid* systems interest you? Triple-lok flare fittings? *Ferulok* flareless fittings? New directional control valves? Any others?

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GROWING HORIZONS FOR FLUID POWER

NEWS • ACTIVITIES • PLANS

Are You Spending Enough for Research?

If the recent quarterly report of the Armour Research Foundation of Illinois Institute of Technology is a criterion, industry is spending more than ever on research. The Foundation, world's second largest independent research organization, recorded a 39 percent increase in industry-sponsored research for the first quarter of 1953-54 as compared with the same period a year ago.

Government-sponsored research remained at relatively the same level as last year, increasing only 1 percent, according to Dr. Haldon A. Leedy, vice president and director of the Foundation. The increase in industrial volume accounted for an over-all gain of 10 percent, or almost a quarter million dollars.

Operation "Shakedown"

Nearly a dozen Committee meetings of the National Fluid Power Association were held during January and February. In addition to the announced objectives of these meetings, an important, unannounced purpose was realized. This was the shakedown in the thinking of those who attended as to the identification and the extent of the industry that produces hydraulic and pneumatic components, circuits and systems, as well as related units, materials and services.

The process of an industry discovering itself is always constructive. It is constructive for the member manufacturer; first, as it identifies his company as a definite part of an industry; second, it proves that when such problems as design, manufacturing, education, distribution and sales are discussed frankly, every participant gains; third, that the effect of action as a representative industry group has a prestige value far greater than the efforts of any single manufacturer or organization could possibly have.

This process is equally constructive for the industries served. First, every association effort tends to clarify nomenclature, ratings, and design standards. This means greater confidence of present customers. It means new customers. Added, it means more buyers and users. Second, it stimulates design and application thinking and operation and maintenance procedures on the part of the user. Logically, this leads to less missionary educational and engineering work for field engineers, dealers and distributors.

New Faces in the Hydraulic and Pneumatic Field

Field visits, conversation at group meetings and a definite flavor in our editorial correspondence gives us hints on the types of companies that are interested in and are entering the hydraulic and pneumatic component manufacturing field. Two groups are conspicuous. First is the airframe and aviation accessory supply manufacturer. It is entirely logical, as more and more manufacturers in these two groups are proving to themselves, that they build and supply more fluid power units, especially those which they, in many cases, already design and modify for their own use.

The second type of organization is the established, old-line company that is seeking diversification of products and markets. An index of this interest is the number of product and market studies made by or for such companies. For example, more product and market surveys in the hydraulic and pneumatic field were made last year than in any previous year. Some of these companies have purchased or developed units of their own. Marketing methods have been minutely scrutinized. There is little doubt but that there will be new faces among manufacturers of hydraulic and pneumatic equipment.

Patent Expires on Meter-out Circuit

Up until January of this year, any manufacturer using a pressure compensated flow control meter out circuit on machine tool had to add a royalty payment to the price of the flow control valve. While the construction of a flow control valve is the same whether it's in a meter-in, meter-out or bleed off circuit, the patent situation made it necessary for the valve manufacturer to maintain different model numbers. Now that the patent has expired, the valve manufacturers are simplifying their model numbers. The meter out circuit can now be applied to any machine without a royalty cost.

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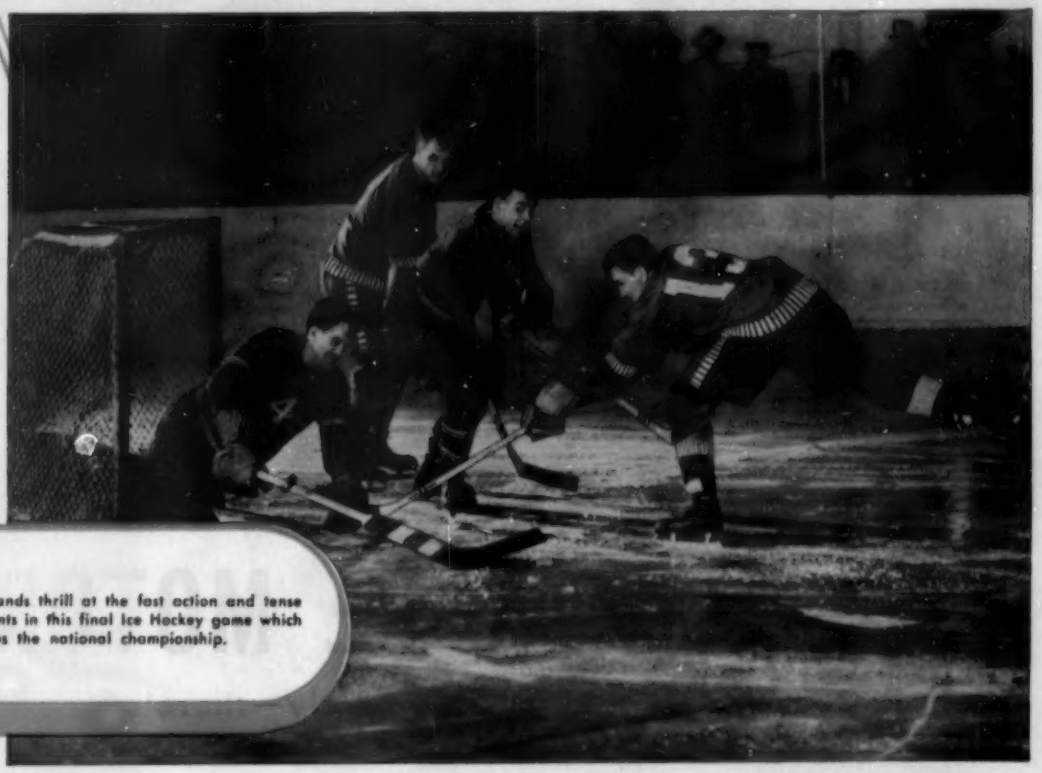

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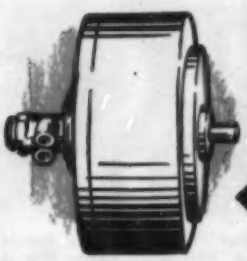

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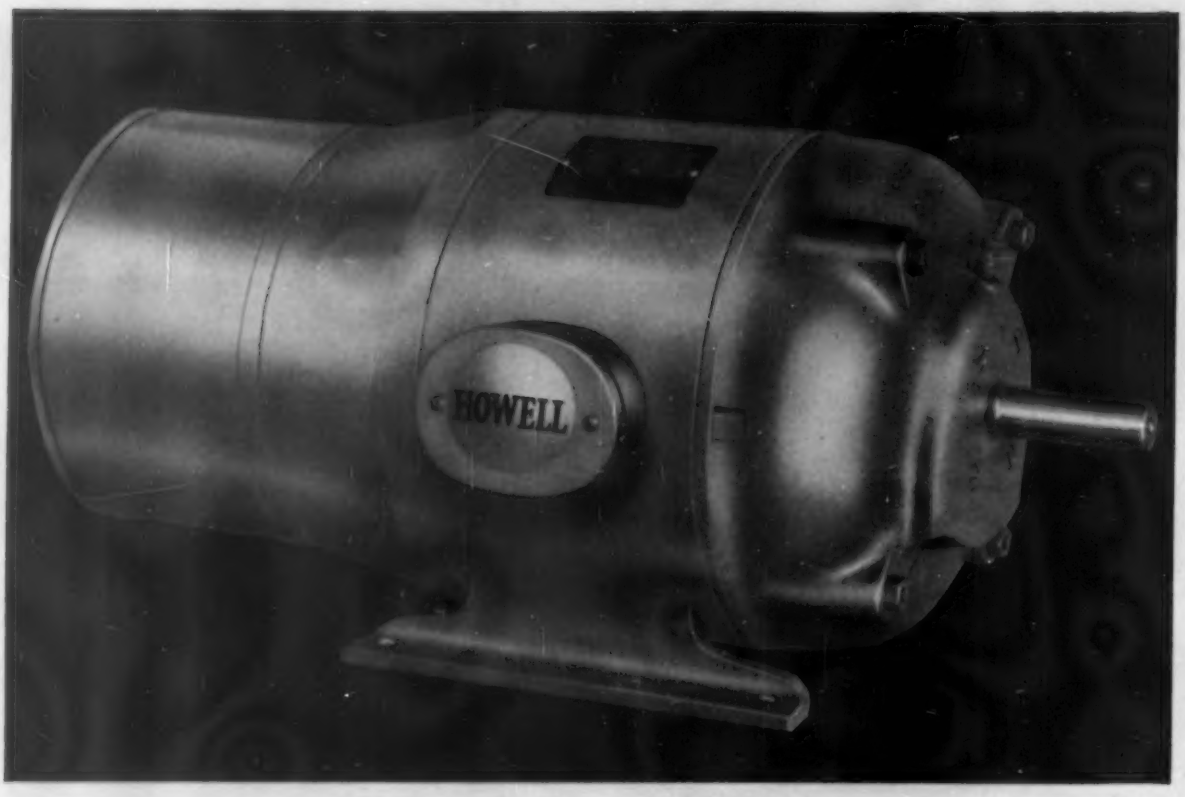

HOWELL BRAKE MOTORS

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The Howell Brake Motor is designed for use in those applications where rapid stopping of rotation is required. Howell Brake Motors are used extensively on such machines as lathes, planers, drill presses and dumbwaiters.

Quick stoppage can be accomplished on motors of all types in most sizes. Brakes are of standard construction for long life and trouble-free operation.

Howell Disc Brakes are integrally mounted, simple in design, easily accessible and quickly adjusted. For complete details on using Howell Brake Motors in your operation, contact the Howell man in your area, or write the factory for Bulletin BR-1 and further information.

Three types of Howell Brake Motors

Howell General Purpose, Dripproof, Horizontal Motor (Type SC) for wall mounting, with integrally-mounted disc brake.

Howell Vertical Face-Mounted Motor with 50 ft.-lb. brake. Howell Brake Motors fit a wide variety of applications.

Howell Special Horizontal Flange-Mounted Pancake Motor with 3 ft.-lb. brake. This streamlined motor is unusually compact.

HOWELL Red Band MOTORS

HOWELL MOTORS

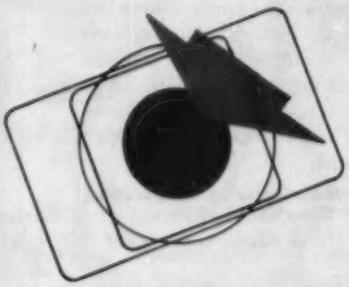
HOWELL ELECTRIC MOTORS COMPANY, HOWELL, MICHIGAN

PRECISION-BUILT MOTORS FOR INDUSTRY SINCE 1915

O-M CYLINDERS

air • hydraulic

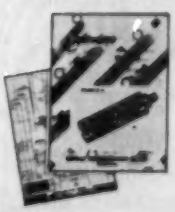
fit where others won't!



O-M Cylinders require up to ⅓ LESS INSTALLATION SPACE than conventional cylinders of the same bore, because O-M's *Special Interlocking Mechanism* eliminates projecting tie rods and bulky end caps. In addition, the "O. D." of O-M Cylinders can be easily and accurately machined for cartridge mounting within your equipment.

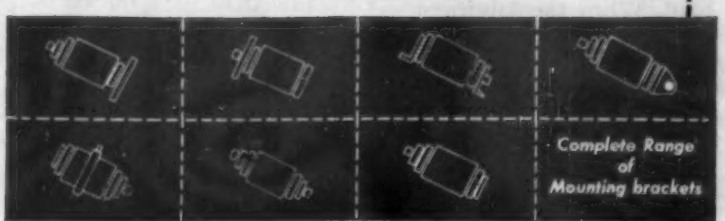
O-M Special Interlocking Mechanism also assures perfect alignment giving O-M the lowest coefficient of friction of any cylinder. Thus, O-M Cylinders are smoother operating at low or high speeds regardless of length of stroke. Easily removed, inspected, repaired, replaced. Completely interchangeable parts.

Available in a full range of sizes (1½" to 8" bores) with standard, 2 to 1 or oversize rods. *14-day delivery on most sizes.*



Write today for FREE catalog and complete set of ½- and ¼-scale templates showing all cylinders and mounting brackets.

mail coupon now!



interchangeable bore for bore

ORTMAN-MILLER MACHINE CO.
1204 150th Street, Hammond, Ind.

☐ Please send latest O-M Catalog
☐ Please send Complete Set of Templates

Name..... Position.....
Company.....
Address.....
City..... Zone.... State.....

NEW PRODUCTS

Components, tools and equipment designed to improve operation of fluid pwer systems are described here . . . for more information fill in and mail the post card bound in this issue.

SHEAR-SEAL SOLENOID VALVES
. . . for pressures to 250 psi

Size: ¼, ⅜ and ½ in. pipe size
Features: These 4-way and 3-way valves are not critical to

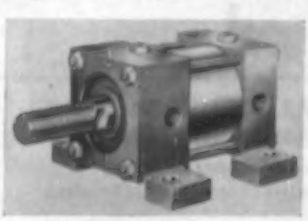
pipe scale or other foreign material in the liquid, because the lapped sealing members are in constant intimate contact. The square corner wiping action of the valves pushes dirt aside and lets it flush out through the return port. No eroding or scoring occurs because flow is through the sealing members and never across the sealing surfaces. They are self-lapping and wear compensating and therefore the sealing qualities of the valve improve with use.

Barksdale Valves
Los Angeles 58, Cal.

Circle 175 on Reader Service Card

AIR CYLINDER
. . . for automation

Sizes: Bore sizes from 1½ through 6 in.
Design: The cylinders, which



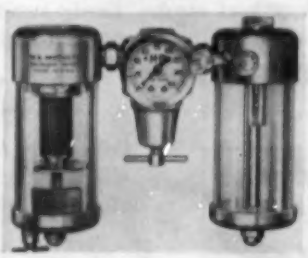
are designed to operate at pressures up to 200 psi have a unique cartridge type rod packing and bearing, which makes possible a quick change of packing with minimum down time.
Features: Extra large, hardened piston rods, double porting for extreme high speeds, extra long cushions, interchangeable check and cushion adjustment valves, rolled steel end plates. The design provides minimum mounting and envelope dimensions.
Applications: Especially suited for automation applications as well as for general use on conveyors, machine tools, presses and welding machinery. They also meet requirements of foundry, oil field and steel mill equipment.

The S-P Manufacturing Corporation,
Cleveland 6, Ohio

Circle 176 on Reader Service Card

AIR LINE LUBRICATOR
. . . has positive shutoff

Feature: The automatic air line



lubricator has a positive shut-off of air without shutting down the air line, by closing valves on the head. When the lubricator is filled it is only necessary to open the shut-off valve and then adjust the flow of oil, by the oil adjusting valve.

M-B Products,
Detroit, Mich.

Circle 177 on Reader Service Card

TUBE CUTTER
. . . for any diameter and length

Design: Works on the shear principle. Cutting the tube without waste or loss of stock, it leaves a flat unburred edge.
Operation: The machine is loaded from the front by sliding the

tube onto the cutting arbor. The operation is entirely automatic. A carriage moves the tube forward until it meets the stop—the cutting action takes place, the sheared piece falls into a container, the tube is moved forward again for the next cutting action. The entire cycle takes about one second depending upon the length of the piece and the diameter and thickness of the tube.
Application: Tubes can be cut into pieces of any length from ⅜ in. up. The machine will handle tubes of any diameter from ⅜ to 2 in. Special adapters for larger tubes are available. The tube cutter will handle tubes in a wide range of stock thickness. Tubes made of mild steel, stainless steel, brass, copper, aluminum can be cut.

Brehm Division,
The Steel Products Engineering Company,
Springfield, Ohio

Circle 178 on Reader Service Card

For more New Products turn to page 113

Over 10 Months of Efficient 24 Hours-A-Day Production WITHOUT SERVICING FILTERS!

This is the report by Mr. Leo Paszkiet after his experience with

MARVEL SYNCLINAL FILTERS

Mr. Leo Paszkiet, Supt. of Maintenance
P. R. MALLORY PLASTICS, INC., Chicago, Ill.

"We have one injection molding press here that was giving me a lot of trouble. In order to maintain our 24-hour-a-day schedule, I had to stop it every two weeks to service the filters. It was a troublesome, time consuming job but it just had to be done. Even then, the machine never seemed to reach the productive capacity I knew it was capable of. Well, I had enough of that so I pulled out the original filters and replaced them with the three 50 G.P.M. Sump type Marvel Synclinal Filters. That was over ten months ago. During all this time the machine was operating faster and smoother than it ever had before. There was no more slow down of production due to pressure loss, vibration, pump starvation, etc. Assuming that the filters were about due for servicing, I took them out and what I saw convinced me they could have stayed there for another two months. Filtered out dirt was evenly distributed over the entire filtering surface and not jammed up in spots that usually cause pressure build-up. I took the filters apart, dipped them in a solvent for one minute, blew them clean and dry with an air hose, put them back together again and back into the machine. The whole operation took about 15 minutes. On the basis of these results, we are installing Marvels on every hydraulic machine in our plant, except of course, those on which Marvel Synclinal Filters were installed as standard equipment by the manufacturer".

For Dependable Protection On All Hydraulic And Low Pressure Liquid Circulating Systems

SUMP TYPE
(Cutaway)

The BALANCED Synclinal Design of Marvel Filters provides that all-important balance between maximum ACTIVE filtering area and sufficient capacity for storage of filtered out particles. In the plants of America's industrial giants as well as in smaller plants, Marvel Synclinal Filters are doing an excellent job protecting machines and increasing production. They are proving their superiority in the one real test—ON THE JOB! Marvel Synclinal Filters operate longer between cleanings, require less maintenance down-time and thereby achieve more production. Not only plant operators and maintenance men, but also over 400 original equipment manufacturers have recognized the superiority of Marvel Synclinal Filters and install them as standard equipment.

EASY MAINTENANCE

Marvel Synclinal Filters may be easily disassembled, cleaned and reassembled in a matter of minutes by any workman. Line type operates in any position and may be easily serviced without disturbing pipe connections.

A SIZE FOR EVERY NEED

Marvel Synclinal Filters, sump or line type, are available in capacities from 5 to 100 G.P.M. and choice of mesh sizes ranging from coarse 30 to very fine 200.

IMMEDIATE DELIVERY

Marvel not only delivers a top grade filter in both quality and performance, but delivers IMMEDIATELY. If desired, shipments are made the same day orders are received.

LINE TYPE
(Cutaway)

WATER FILTERS In response to the great demand, we have adapted both our sump and line type models for use in all water filtering applications. No changes have been made in the basic synclinal design.

MARVEL *Engineering Company*

Meets J.I.C. Standards

625 WEST JACKSON BLVD., CHICAGO 6, ILLINOIS
Phone Franklin 2-4431

Marvel Engineering Company AH-4
625 W. Jackson Blvd., Chicago 6, Ill.

Without obligation, please send me complete data on Marvel Synclinal Filters as follows:

Catalog #106 for Oil Filters
Catalog #300 for Water Filters

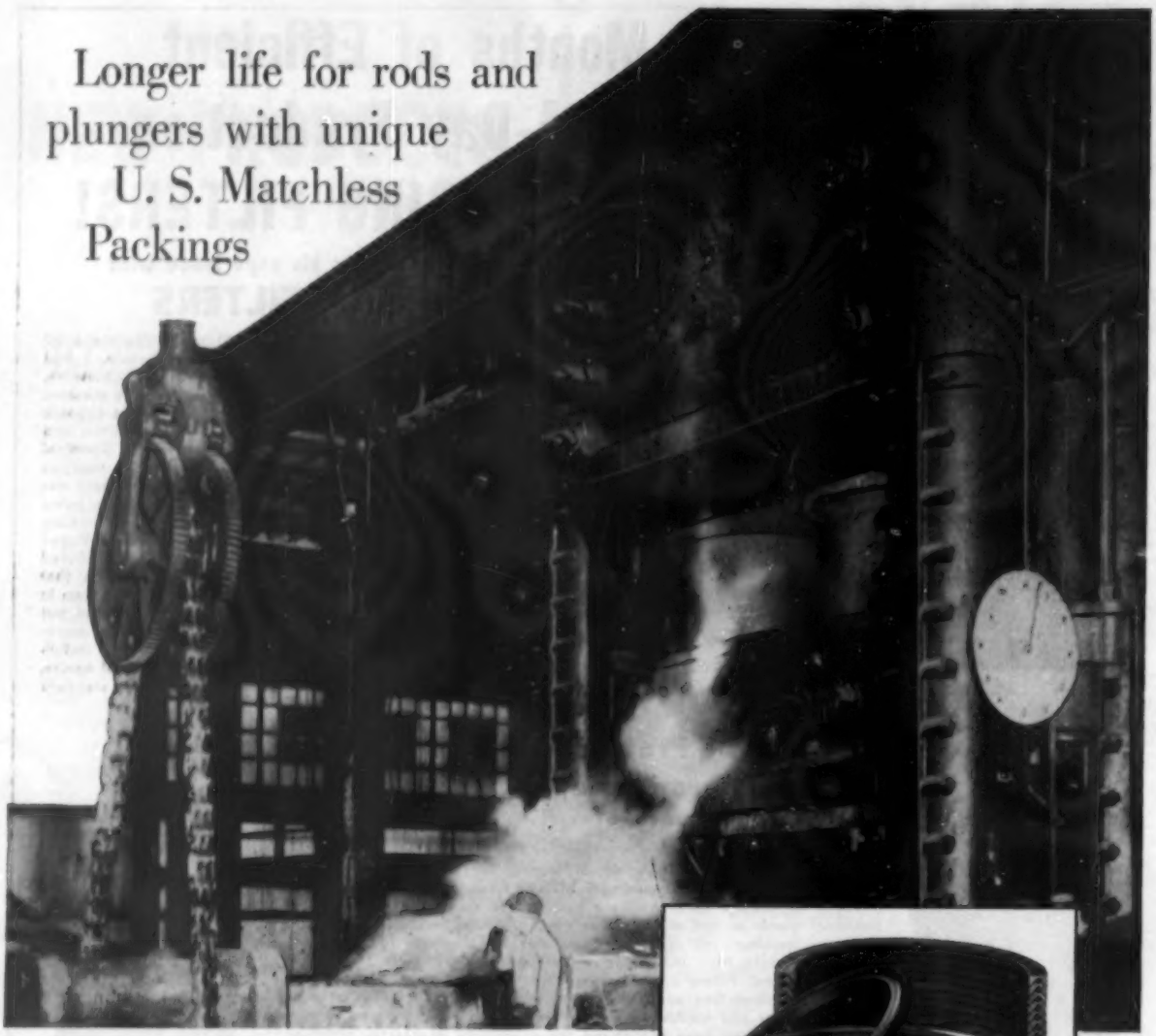
Name .....

Company .....

Address .....

CITY ..... ZONE ..... STATE .....

Longer life for rods and plungers with unique U. S. Matchless Packings



No other packing has *all* these advantages:

- **Blunt edges**—provide uniform strength throughout.
- **Triangular spaces**—to trap loose scale, oil.
- **Pressure break**—provides faster, more effective action.
- **Molded end rings**—no sharp edges to break off.
- **Easy to install**—because of parallel (not flare type) side walls.

Matchless® Packing reduces wear and tear on rods and plungers, minimizes friction because it has a self-adjusting, automatic action. Designed for hydraulic equipment, presses, rams, triplex pumps and outside packed pumps. This *quality* U. S. Matchless Packing is obtainable through any of the 26 "U. S." District Sales Offices—each staffed with engineers—or one of our selected distributors. Or write to address below.

U. S. Matchless Packing comes in 12 different styles, to handle pressures up to 8,000 lbs. per square inch.

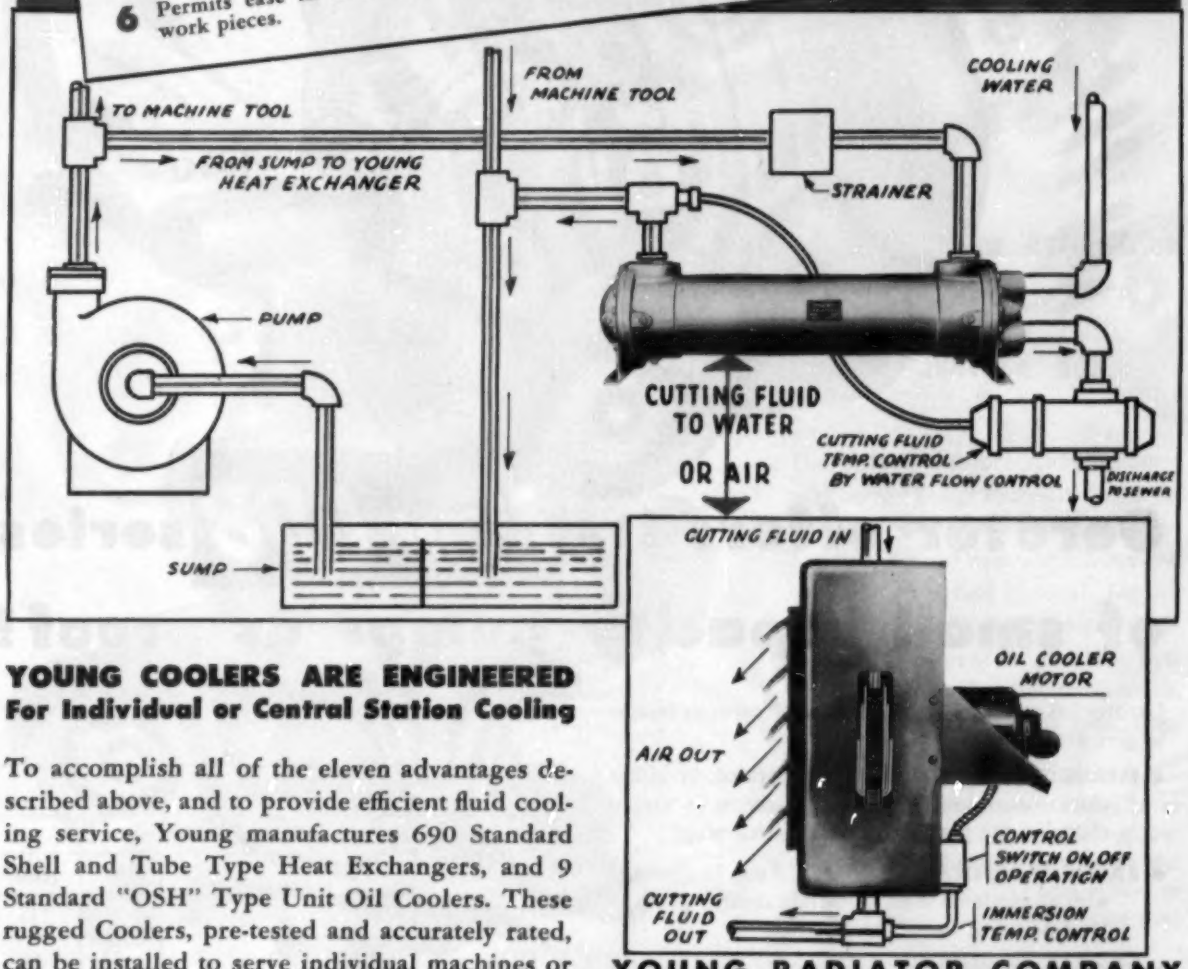
"U. S." Research perfects it.
"U. S." Production builds it.
U. S. Industry depends on it.

UNITED STATES RUBBER COMPANY
MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Hose • Belting • Expansion Joints • Rubber-to-metal Products • Oil Field Specialties • Plastic Pipe and Fittings • Grinding Wheels • Packings • Tapes
Molded and Extruded Rubber and Plastic Products • Protective Linings and Coatings • Conductive Rubber • Adhesives • Roll Coverings • Mats and Matting

11 Reasons Why: CUTTING FLUIDS Should Be Cooled!

1. Assures uniform expansion of work piece, allowing closer tolerances.
2. Eliminates non-uniform expansion of machine tool which produces excessive wear on bearings, and friction on slides, guides and ways.
3. Maintains viscosity of cutting oil.
4. Increases accuracy and convenience of gauging.
5. Reduces size of storage tank or sump.
6. Permits ease in handling because of cooler work pieces.
7. Prevents staining of tool and work piece from overheated, fortified cutting oil compounds breaking down.
8. Permits the speeding up of the machining operation.
9. Increases tool life.
10. Minimizes machine adjustment.
11. Control of run-outs.



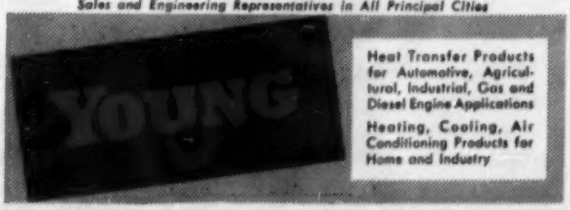
YOUNG COOLERS ARE ENGINEERED
For Individual or Central Station Cooling

To accomplish all of the eleven advantages described above, and to provide efficient fluid cooling service, Young manufactures 690 Standard Shell and Tube Type Heat Exchangers, and 9 Standard "OSH" Type Unit Oil Coolers. These rugged Coolers, pre-tested and accurately rated, can be installed to serve individual machines or several cutting, grinding, milling or boring operations from a central cooling station. Young "OSH" Unit Oil Coolers can effect plant heating economies by utilizing waste heat to warm room interiors. For additional information, see your nearest Young Representative listed in the Yellow pages of the phone book, or write direct to, Young Radiator Company, Racine, Wisconsin.

YOUNG RADIATOR COMPANY

DEPT. 444-D • RACINE, WISCONSIN

Plants at Racine, Wisconsin and Mattoon, Illinois
Sales and Engineering Representatives in All Principal Cities



Heat Transfer Products for Automotive, Agricultural, Industrial, Gas and Diesel Engine Applications

Heating, Cooling, Air Conditioning Products for Home and Industry

Leaders in Heat Transfer Engineering for more than 25 years

EVEN [illegible] CAN BE IMPROVED

Gerotor offers its *New QDB* series of small capacity pumps as proof!

Gerotor has redesigned its series of small capacity pumps to give even more . . .

- **FLEXIBILITY**—the QDB can be operated in either clockwise or counterclockwise direction by simply changing the position of one internal plug!
- **RANGE OF APPLICATION**—the QDB can be obtained with an extended shaft to operate another pump in tandem, off of one motor!
- **DEPENDABLE SERVICE**—the QDB is built to give more dependable service over a longer service span than any comparable pump. Its longer life reduces your maintenance and replacement costs.

If you have need for pumps in the QDB range, call on Gerotor.

Gerotor makes a complete line of hydraulic pumps in ranges from .4 g.p.m. to 40 g.p.m. The Gerotor engineers can help you solve your hydraulic pump problems. Write for *free literature* and full particulars.

Check this capacity table . . .

Type	Delivery g.p.m.—1800 r.p.m.				
	Discharge Pressure p.s.i.				
	0	250	500	750	1000
QDB .4	.42	.40	.38	.35	.31
QDB .75	.84	.80	.78	.73	.66
QDB 1.5	1.67	1.62	1.57	1.50	1.42

GEROTOR MAY CORP. - Box 86 - Baltimore 3, Md.

GEROTOR
HYDRAULIC PUMPS & MOTORS

SPEED KING

SOLENOID PILOT OPERATED CONTROL VALVE

by VALVAIR

DESIGNED AND BUILT TO J. I. C. STANDARDS

- **A Hefty Assist to Automation**
- **Fully Enclosed**
- **Integral Junction Box**

The Valvair line broadens again — with Speed King's exclusive features. All parts are totally enclosed. The Speed King will operate submerged in water or buried in sand. Simplicity! — only two moving parts. Molded coil — no wear or shorting out. 20,000,000-cycle life and more. Speed King is industry's most rugged and compact valve.

Other *features*: for pressures from 35 to 200 p.s.i. pneumatics, hydraulics, vacuum; complete line — 2-way, 3-way, 4-way and 4-way-5-port (2-pressure) models; foot or sub-base (manifold) mounting; pipe sizes — 1/4", 3/8", 1/2", 3/4" and 1".

Ask for Bulletin "A-4"

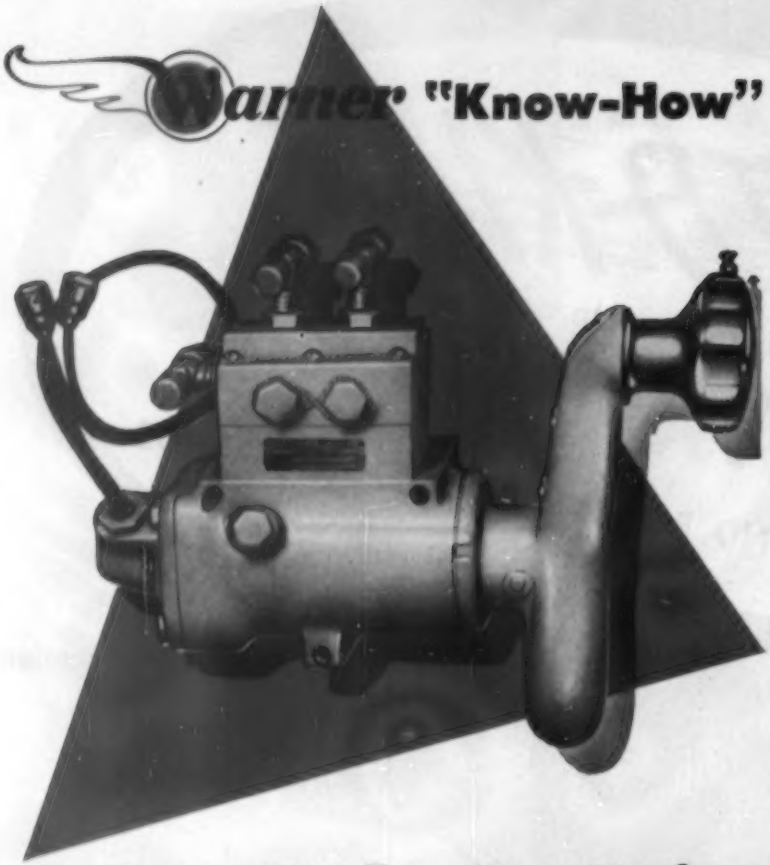
Booth No. 2116
A.S.T.E. SHOW

Representation in: BALTIMORE • BIRMINGHAM • BOSTON BROOKLYN • BUFFALO • CHARLESTON, W. VA. • CHICAGO CLEVELAND • CRANFORD, N. J. • DAYTON • DENVER DETROIT • EUREKA, CALIF. • GLENSIDE, PA. • HOUSTON KANSAS CITY, MO. • LOGANSPORT, IND. • LOUISVILLE MILWAUKEE • MINNEAPOLIS • PASADENA • PITTSBURGH PORTLAND • ST. LOUIS • SAVANNAH • SEATTLE MONTREAL • TORONTO • VANCOUVER

VALVAIR CORPORATION *Affiliate: Sinclair-Collins Valve Company*
951 BEARDSLEY AVE., AKRON 11, OHIO

Rely Upon Valvair DIVERSATILITY

Warner "Know-How"



The "Know-How" to Mass Produce Precision Hydraulic Equipment

The hand pump shown above is a typical example of Warner's ability to mass produce precision hydraulic equipment. This pump is used in connection with a special ordnance application requiring high volumetric efficiencies and must be produced to very close tolerances.

Warner is qualified by experience and facilities for the design and production of hydraulic equipment for a wide range of uses.

Warner engineers will welcome an opportunity to assist you in the development of special hydraulic equipment to meet your particular requirements.

Send for your copy of an illustrated folder describing typical examples of Warner Hydraulic Equipment.

Warner DIVISION OF DETROIT HARVESTER CO. OF N.Y. INC.
14300 TIREMAN AVENUE • DETROIT 28, MICHIGAN
DESIGNERS AND MANUFACTURERS OF PUMPS • VALVES • ACTUATORS

LETTERS to the Editor

J.I.C. Symbols

You recently published an article explaining the standard component symbols currently used in hydraulic drawings. We are very much interested in obtaining information which will aid us in drawing our present and planned future hydraulic systems. We would appreciate receiving the names and addresses of those who could supply us with more material concerning hydraulic equipment design and drawing.

J. W. HELGESON,
Mfg. Engineering Section
Small Appliance Division,
General Electric Company

We believe you refer to our series "Know Your Component Symbols for Hydraulic Circuits" which was published serially in 1952 *and which was reprinted. The reprint is now exhausted. The basic symbols are to be found in the J.I.C. Hydraulic Standards for Industrial Equipment, copies of which are available from Joint Industry Conference, Box* 182, *Northend Station, Detroit* 2, *Mich. Vickers, Inc. has published Bulletin* 940-*S which gives J.I.C. type symbols for each component made by this company. The largest group of J.I.C. symbols in actual circuits is in the section "Fluid Power Circuits", published in the January,* 1954 *Directory issue of APPLIED HYDRAULICS. Single copies are available at* $.50 *each.*

"35 gpm at 10,000 psi"

We have an inquiry from one of our better customers which expresses a need for pumping equipment in the order of 35 gpm at 10,000 psi. Obviously, this requirement can be met by the use of pumping equipment at conventional pressures and with reciprocating pres-

Continued on page 24

When it's high pressure... it's AMERICAN!

For variable pressures up to 3000 p.s.i. . . .

HELE-SHAW

THE FAMOUS HELE-SHAW is a radial-piston variable displacement fluid power generator. It is remarkably easy to apply to the machine it serves . . . may be installed on or near the machine, remote from it, or incorporated as an integral part of the design.

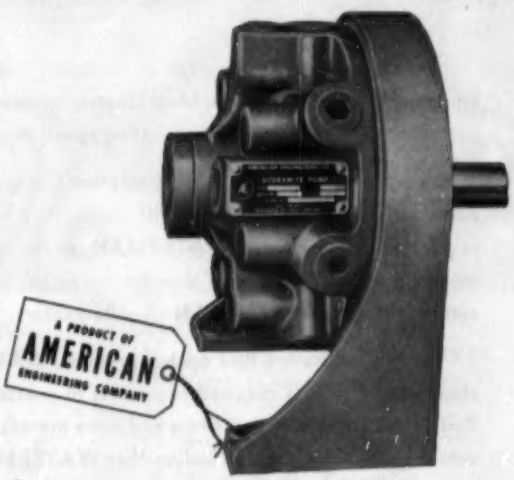
In the Hele-Shaw pump, pressure and reversal of flow are controlled directly at the pump. Discharge is infinitely variable from zero to maximum . . . and can be reversed instantaneously or gradually. Capacities range from 3¾ to 50 g.p.m. and upward.

For pressures up to 5000 p.s.i. . . .

HYDRAMITE

THE HYDRAMITE is a radically new radial-piston constant displacement fluid power generator . . . has an overall efficiency of 85% without supercharging. Direct-driven through a flexible coupling, Hydramite rotates in either direction . . . can be foot, flange or face mounted. It is available in 3, 5, and 10 g.p.m. oil capacities.

Products of American Engineering Company, the Hele-Shaw and Hydramite Pumps are outstanding in their respective high pressure ranges . . . bringing users top efficiency and economy on a vast and growing variety of hydraulically-operated equipment. Mail coupon for full information.



AE

AMERICAN ENGINEERING COMPANY

PHILADELPHIA 25, PENNA.

AE Products include: Hydramite and Hele-Shaw Fluid Power, Taylor and Perfect Spread Stokers, Marine Deck Auxiliaries, Lo-Hed Hoists, Lo-Hed Car Pullers

American Engineering Company
2530 Aramingo Avenue, Philadelphia 25, Pa.

Gentlemen: ☐ Kindly send me complete information about the new HYDRAMITE. ☐ Hele-Shaw.

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

for

Predetermined SAFETY and CONTROL

Automatic Transportation Company uses **WATERMAN FLOW REGULATORS** as standard equipment on fork lift trucks. Mast Control for raising, lowering, forward tilting and reverse tilting is all controlled at a safe, efficient operating speed regardless of load on the forks.

When Automatic Transportation Company decided to use hydraulic pressures (2500-3000 PSI) never before attempted on fork lift trucks, they were faced with the problem of obtaining the right flow regulator. They turned to **WATERMAN** for the answer! Now, anything from eggs and television sets to molten metal or automotive dies can be lifted, lowered and transported safely, smoothly, and efficiently, thanks to **WATERMAN** Flow Regulators.

If you have a flow control problem, **WATERMAN** can do the same for you. Where ever constant flow of fluid is required regardless of pressure or back pressure fluctuations, **WATERMAN** Flow Regulators are the answer. More and more manufacturers incorporating hydraulic equipment in the products they manufacture are finding that **WATERMAN** Flow Regulators simplify circuits, reduce weight, space and cost while providing automatic flow regulation.

Available in a range of sizes and a variety of models to take care of your requirements.

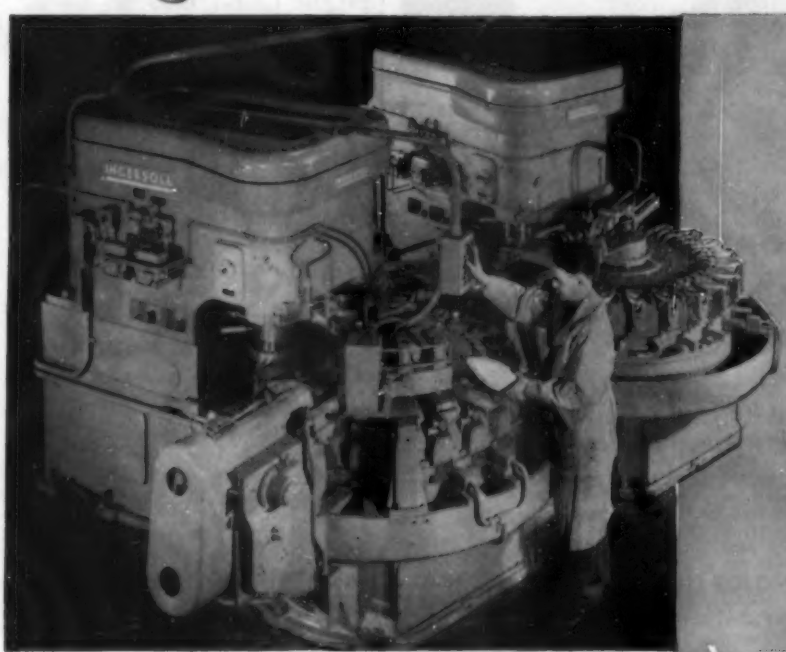
Waterman

Write for our illustrated brochure A

ENGINEERING COMPANY

725 CUSTER AVENUE • EVANSTON, ILLINOIS

SNAP-LOCK TRADE MARK plays a vital part in new plant-automation plans



TWO COMPARTMENTS
sealed off—self-protected

ELECTRICAL SIDE

Accessible wiring connections, self wiping coin silver contacts, no arcing, heavy insulation throughout, oil and dust resistant case. Single pole, double break, double throw —positive lock in ON or OFF position.

MECHANICAL SIDE

Hardened steel parts, strong spring, rugged, compact construction, wide choice of operating levers. Snap-Lock is guaranteed mechanically and electrically for any normal circuit application.

Snap-Lock is the heavy duty limit switch—quick acting, positive, dependable—built *by* machine tool builders *for* machine tool builders.

In the 15 years since we first designed Snap-Lock to meet our own machine tool needs, it has been adopted as the standard switch equipment by 4 out of 5 of all builders of precision operated machine tools. Hundreds of users of other types of equipment also specify Snap-Locks—where control is vital, where lasting and service-free life is more important than mere price.

If you have a switch problem, choose from the wide variety of Snap-Lock standard types with regular or special mountings or, if you need a special application, let our engineers help you design Snap-Lock into your product.

Ask for Engineering Bulletin EM-51

INGERSOLL says:

"For this special model, again we rely on 13 Snap-Lock switches to insure correct sequencing of all 6 operations for automatic milling of tops, bottoms and sides of sole plates for electric flat irons at 1000 per hour-- fastest rate ever attained."

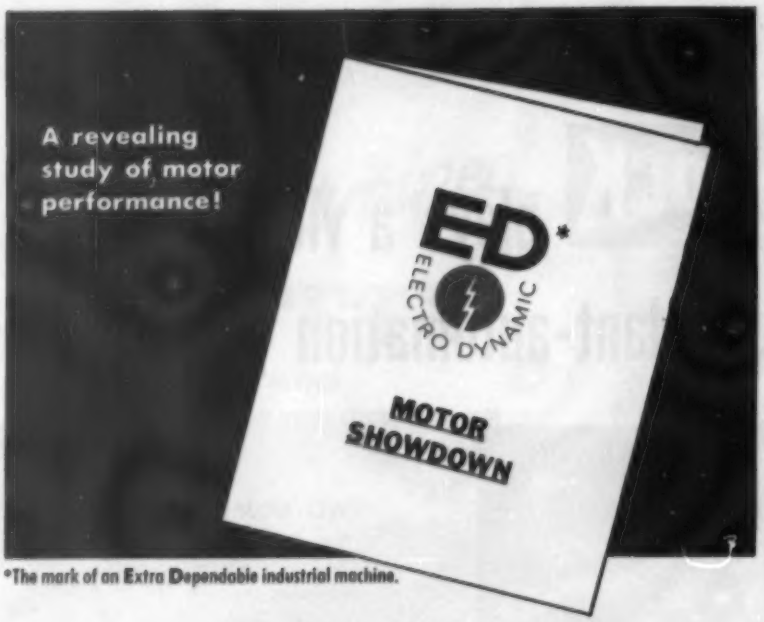
The Ingersoll Milling Machine Co. at Rockford, Ill., top flight builders of precision automatic milling, boring and drilling machines, have for years standardized on Snap-Lock limit switches.

ELECTRICAL MANUFACTURING DIVISION

The NATIONAL ACME COMPANY

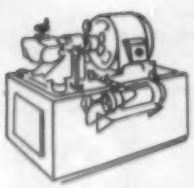
170 EAST 131st STREET • CLEVELAND 8, OHIO

ACME-GRIDLEY
BAR and CHUCKING AUTOMATICS
1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • Limit, Motor Starter and Control Station Switches • Solenoids • Contract Manufacturing



*The mark of an Extra Dependable industrial machine.

THIS CANDID REPORT UPSETS MANY IDEAS ON MOTOR SELECTION FOR HYDRAULIC MACHINES



1 to 250 hp. AC and DC. Standard or special purpose. N.E.M.A. standards.

The results of comparative performance tests* on production line models of different makes of electric motors are reported concisely in a new booklet entitled **"MOTOR SHOWDOWN"**. The facts revealed are of real importance to anyone concerned with motor selection, because the makes of motors tested power over 90% of the electrically operated machinery in *your* industry. Mail the coupon below for your copy.

*Tests certified by J. Arthur Balmford, Professor of Electrical Engineering at a leading Eastern university

ELECTRO DYNAMIC
Extra Dependable motors

ELECTRO DYNAMIC • *Division of General Dynamics Corporation*
170 Avenue A, Bayonne, New Jersey

Please send me a copy of "MOTOR SHOWDOWN" and the new catalog of Electro Dynamic industrial motors.

NAME_____
COMPANY_____
ADDRESS_____

Letters to the Editor

Continued

sure intensifiers, but the customer seems insistent upon doing the job without resorting to the intensifier system. Is there a manufacturer producing large volume pumping equipment in these extreme pressure ranges? We are also interested in hydraulic torque actuators. We are well acquainted with the product manufactured under the trade name "Hydromotor" by the Bonnot Company in Canton, Ohio. We are interested in obtaining other sources for this type of equipment and have recently been informed that a similar item is manufactured under the name "Birch". Could you verify such a company for us?

E. C. DITZEN,
Ditzen Engineering & Sales Co.

We are afraid that your customer is asking too much. The only standard 10,000 psi pump that we know is a 5 gpm unit made by Simplex Engineering Company, Zanesville, Ohio. It is possible that a triplex pump might be used. Such companies as Aldrich Pump Co., Allentown, Pa., or Kobe, Inc., Huntington Park, Calif., may be able to make suggestions to you. The only hydraulic torque actuator we know is the "Hydromotor" made by the Bonnot Company.

Standard Manuals on Hydraulics

Can you tell us where we can purchase the following books mentioned on page 25 of your December issue: "Oil Hydraulic Power and Its Industrial Applications" by Walter Ernst; "Fluid Pressure Mechanisms" by H. G. Conway; the text "Hydraulics" used in the Henry Ford Trade School.

ROBERT C. MILLER
Benton Harbor Engineering Works, Inc.

You can obtain "Oil Hydraulic Power and Its Applications" by Walter Ernst from McGraw-Hill Publishing Co.; "Fluid Pressure Mechanisms" by H. G. Conway from Pitman Publishing Corporation. The text, "Hydraulics" was

Continued on page 28

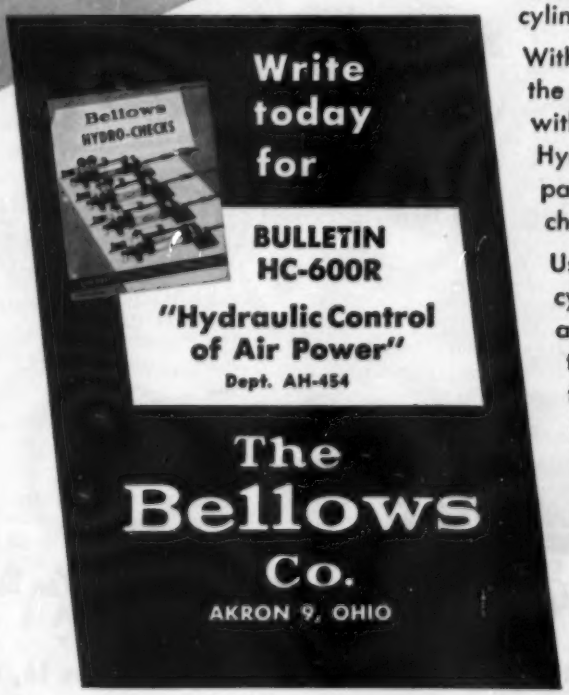
Hydraulic control of air cylinder operation gives absolute smoothness of piston rod movement

Compressed air has "bounce" and "springiness," ideal for many operations. But this "bounce" and "springiness" of air can be troublesome when air cylinders are used to feed tools to work.

With the Bellows Hydro-Check you can combine the speed, economy and flexibility of air power with the smoothness of hydraulics. The Bellows Hydro-Check gives an air-powered piston rod unparalleled smoothness, completely free from chatter.

Using the Bellows Hydro-Check, with any air cylinder, you can advance the tool to the work at a high rate of speed, check the advance as the tool reaches the work, feed the tool through the work at the feed rate best suited for tool and material, and with rapid return of tool to starting position.

Result: Almost twice as many minutes actual machining time each hour; longer tool life through better control of feed rate; fewer rejects.



870-A

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½" to 1½" Sizes
For Pressures to 2000 psi
Catalogs VRD-1 through VRD-8

High-Pressure Axial-Piston PUMPS
Constant or Variable Volume
For 2500, 3000 and 5000 psi Circuit Needs
3.5 to 35 gpm Capacities
Catalogs P-4 through P-4-10

High-Torque Axial Piston FLUID MOTORS
Torque Ratings 13.8 to 112 inch-pounds per 100 psi (about 3 to 180 hp maximum)
For Pressures to 5000 psi
1500 to 3000 rpm
Catalogs FM-1, FM-2, FM-3-A

Dual-Purpose, Vane-Type PUMP/MOTOR
Ready for either pump or motor use without change
Shaft rotation in either direction
Four Sizes, 11 Models
Pumping Capacities: 3 to 82 gpm.
Motor Torque: 13 to 257 inch-pounds per 100 psi. Pressures to 2000 psi.
Bulletin P-5

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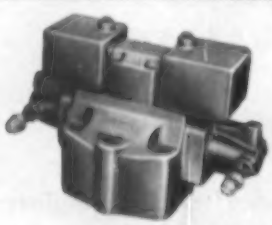
Industrial and Aircraft Types
Eliminate Destructive Hydraulic Pressure Shock
¼" to 1" Sizes
For Pressures to 5000 psi
Catalog VS-1-A



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Manual, Mechanical, Electric or Pilot Control. ¼" to 2" Sizes
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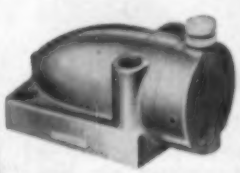
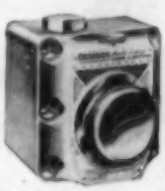


PRESSURE REDUCING VALVES
⅜" to 1½" Sizes
20 gpm to 65 gpm Capacities
For Pressures to 5000 psi
Catalog VPR-1



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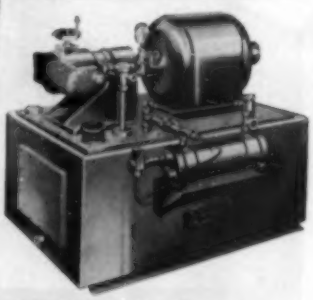
Full-Scale Regulation—Adjustable for Varying Input
¼" to ⅝" Sizes
For Pressures to 3000 psi
Catalogs VFC-1, VFC-2



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Constant and Variable Volume
46 Models—2 to 35 gpm Capacities
For Pressures to 5000 psi
Bulletins PU-3-A, PU-4 and PU-5

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under industry's toughest operating conditions

Denison HydrOILic Pumps, Motors and Controls are noted for their combination of high efficiency and rugged dependability.

In addition to fine performance under continuous, heavy-duty use, Denison HydrOILic Equipment offers space-saving design that simplifies circuit layout, makes installation easier, and minimizes maintenance problems.

Because so many users verify the extra value built into Denison Pumps, Motors and Controls, we continue the challenge made so often before—*let comparison prove to you* why they are first choice for so many needs of every type. Write today for full details on Denison HydrOILic Equipment to meet your requirements.

Pilot-Operated, Solenoid-Controlled DIRECTIONAL VALVES
Eliminate Spool-Sticking
¾" to 1½" Sizes, For Pressures to 5000 psi
Catalogs VD-1-1 to VD-4-2

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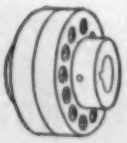
AJAX

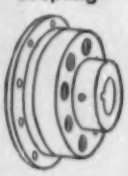
answers to your direct drive problems

Ajax Flexible Couplings are made in a wide range of sizes and capacities to handle alignment problems on direct-driven machines. Hundreds of thousands in use. Performance proven over 30 years. Write for catalog.

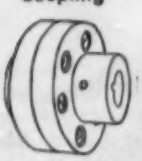


Ajax Type A Semi-Steel and Type S Forged Steel Couplings

Ajax Type SP Shear Pin Coupling



Ajax Type BO Bolt-On Coupling



Ajax Type M Mill Motor Coupling

Ajax Type BD Brake Drum Coupling

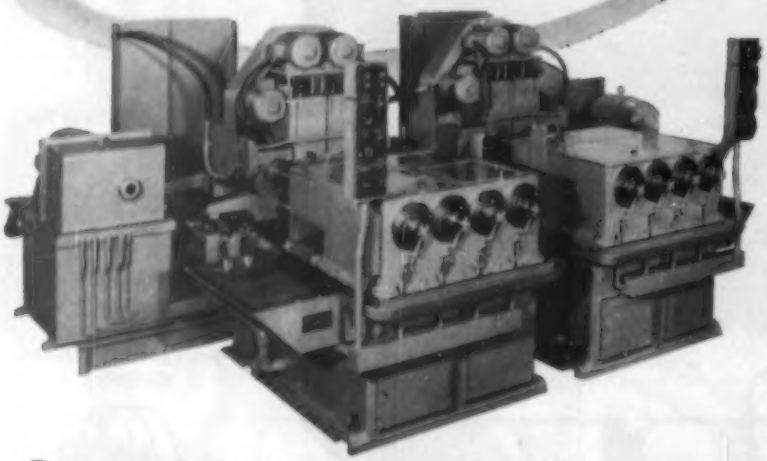
Ajax No. 423-523 Couplings for full motor speeds

Ajax Dihedral Coupling

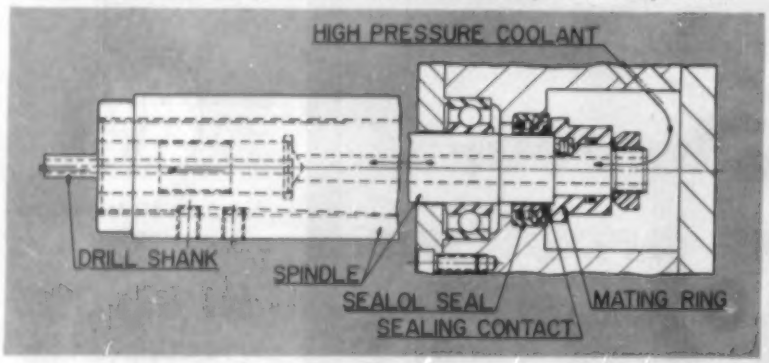
AJAX FLEXIBLE COUPLING CO. INC.

WESTFIELD, N. Y.

How the SEALOL Seal solved a machine design problem . . .



This Krueger-Barnes gun drilling machine is designed for drilling accurate holes to extreme depths. The problem in the gun drilling operation is to get coolant under great pressure to the point of the drill, for cooling, for lubrication, and for chip removal . . . and Sealol helps solve the problem.



The sketch shows the Sealol Seal which makes it possible to keep the coolant flowing to the gun drill under pressures as high as 1,000 psi. Sealol's engineering staff worked in close cooperation with Krueger-Barnes Corporation, adapting proven Sealol mechanical shaft sealing designs to the special conditions of the gun drilling operation.

This designed-in seal is typical of the high-capacity performance obtainable with Sealol Seals. May we help with your shaft sealing problems? Send job description, or write for Bulletin 7 — the complete story on Sealol Balanced Pressure Seals. Sealol Corporation, 9 Willard Avenue, Providence 5, R. I.

SEALOL

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HOUSTON • SAN FRANCISCO
LOS ANGELES • KANSAS CITY (MO.)
CHARLESTON (W. VA.)

THE ▲ BALANCED PRESSURE SEAL

Letters to the Editor

Continued

purchased last year by Vickers, Inc. Copies may be ordered from the Service Department of this company.

High Pressure Water Jet for Cutting

We have been searching without success on the West Coast for information on cutting procedures which involve a high velocity jet of water. We have tried to run down rumors that various government agencies have used high pressure jets of water for cutting such materials as wood and steel. I desire to cut on pattern lines through 2½ inches of Styrofoam, a unicellular expanded polystyrene plastic having a density of only 1.6 pounds per cubic foot. I hope you can help since we are in a tight and expensive fabricating spot.

JAMES M. KING,
Hollywood 46, Calif.

The use of high pressure water jets for cutting Styrofoam is somewhat out of our field. However, we suggest that you get in touch with the Los Angeles office of Dow Chemical Company, producers of Styrofoam. They are located at 900 *Wilshire Blvd. Los Angeles* 17.

"O" Ring Bibliography

The National Bureau of Standards has suggested that we write you for a list of published reports on tests on "O" rings used in piston packing, covering all aspects of performance, such as break-out forces, wear, etc. used in oil, water, air and steam applications. We shall be very grateful if you could send us such a list of reports.

J. J. PESQUEIRA,
Morey Machinery Co., Inc.

The Rubber Division Library, University of Akron, Ohio, has published "O" Rings—An Annotated Bibliography". This was sponsored by the Division of Rubber Chemistry, American Chemical Society. We have asked the Library to forward a copy to you.

Continued on page 33

RACINE

ALL COMPONENTS FOR ANY HYDRAULIC CIRCUIT

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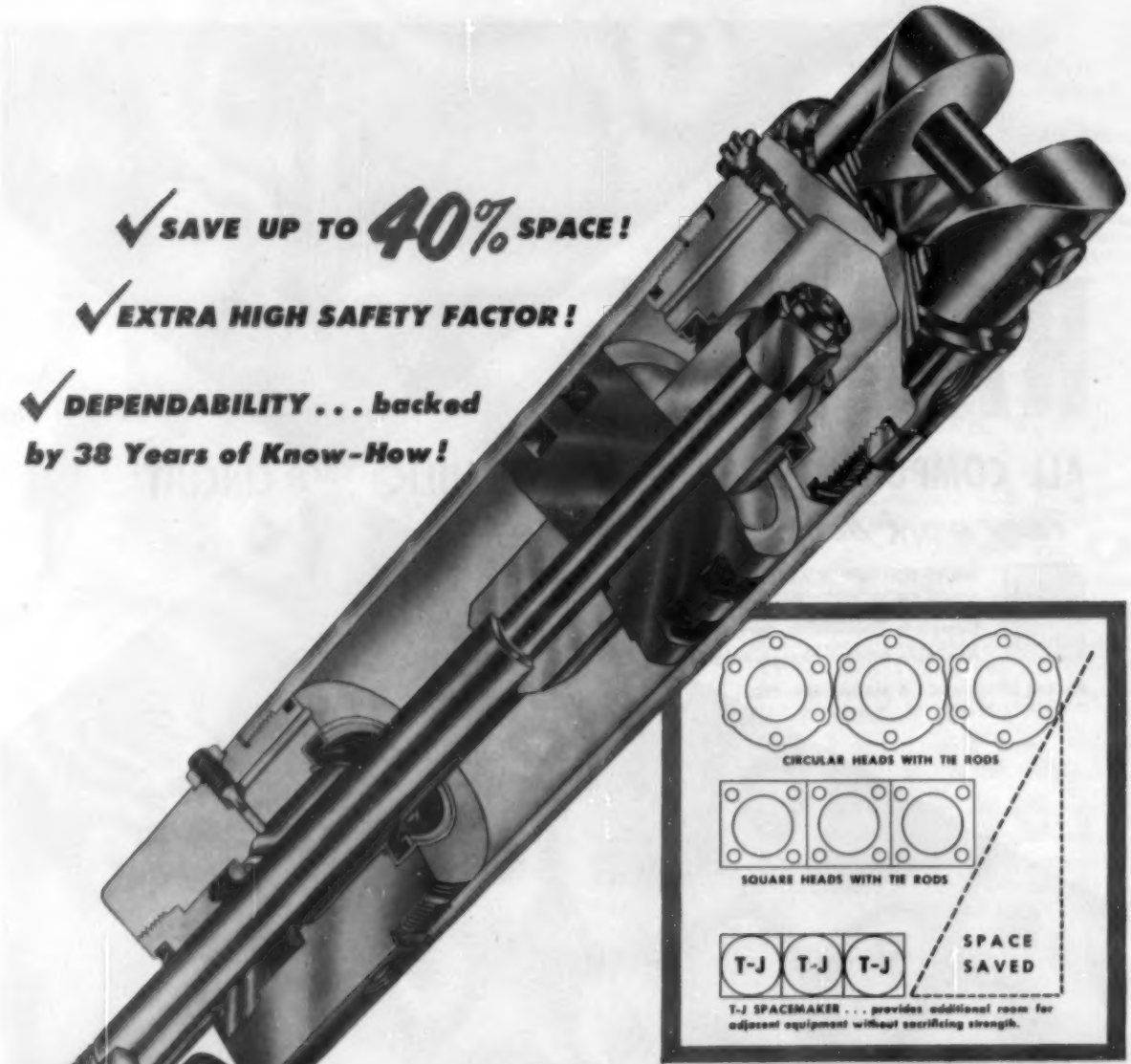
CIRCULAR HEADS WITH TIE RODS
SQUARE HEADS WITH TIE RODS
T-J
T-J
T-J
SPACE SAVED
T-J SPACEMAKER . . . provides additional room for adjacent equipment without sacrificing strength.

Off shelf delivery all styles to 3" bore in increments of 1" to 12" stroke.

NEW (T-J)

Spacemaker AIR CYLINDERS

Streamlined design of the new T-J Spacemaker *eliminates tie rods . . . saves up to 40% in mounting space!* It's performance-proved . . . *super rugged* with extra high safety factor . . . solid steel heads . . . heavy wall, precision honed, *hard chrome plated,* seamless steel body . . . leakproof cylinder head to body construction . . . heavy duty, hi-tensile, *hard chrome plated* piston rod.

Available with the new T-J Super Cushion Flexible Seals which insure positive cushion with automatic valve action for fast return stroke. Many standard sizes and styles . . . for pushing, pulling, lifting, clamping or control jobs. T-J dependability. Write for bulletin 454. The Tomkins-Johnson Co., Jackson, Mich.

(T-J) TOMKINS-JOHNSON
RIVETORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

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Circle 30 on Reader Service Card →

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TWO GREAT PACKING MATERIALS . . . each with a special purpose. In thousands of unusual hydraulic and pneumatic applications custom-developed Sirvene synthetic rubber has earned unique distinction. Now comes a new C/R packing material—**Conpor**—for use where absolute control of porosity is demanded. **Conpor** is Sirvis mechanical leather impregnated with a liquid polymer under controlled conditions, to achieve the exact degree of porosity required for the lubricant problem. **Conpor** retains all the advantages of leather—flexibility, strength, stability, oil and solvent resistance. Sirvene provides a similarly wide range of advantages and is designed, compounded and molded to produce specified characteristics. May we send you "Engineering with C/R Oil Seals" and "Report on Conpor"? They'll give a good starting point for your own sealing problems.

75 C/R

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Sirvene: (Synthetic rubber) diaphragms, boots, gaskets and similar parts for critical operating conditions • Conpor: Controlled porosity mechanical leather packings and other sealing products • Sirvis: Mechanical leather boots, gaskets, packings and related products.

If one Answer is "YES" you should enter the

APPLIED HYDRAULICS PRIZE CONTEST

DO YOU...

Design or sell hydraulic or pneumatic components?

Lay out your own customers' circuits?

Design machine tools or special machines or equipment?

Convert machines and equipment to automatic operation?

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"Trouble Shoot" on circuits?

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A total of

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Awards

FIRST PRIZE	$500.00
SECOND PRIZE	$300.00
THIRD PRIZE	$200.00
Fourth, Fifth, Sixth & Seventh Prizes, ea.	$ 50.00

No matter whether your job is to sell hydraulic and pneumatic components and systems or design tools, equipment and machines or apply, install, operate and maintain such circuits in your own or customers' shop, you have an equal opportunity to win a Prize.

To enter the Prize Contest, simply send for the Entry Blank. The Rules of the Contest and Suggestions to Contestants will be sent promptly with the Entry Blank.

The closing date for the APPLIED HYDRAULICS PRIZE CONTEST is June 1, 1954.

For Entry Blank write

APPLIED HYDRAULICS PRIZE CONTEST EDITOR

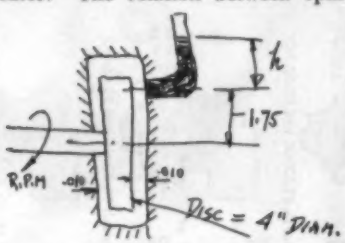
1248 ONTARIO STREET • CLEVELAND 13, OHIO

Letters to the Editor

Continued

Use Bernoulli's Theorem

Have you published an article describing an oil speed indicator? The reason I ask is as follows: in November, 1949, I took a New York State Professional Engineer's License examination, in which the following question appeared. The sketch shows an "Oil Speed Indicator." The relation between rpm



and h is given by rpm = Ch^m. Determine the calibration constants C and m. Note: I flunked on this one. I have written the Board of Examiners and hydraulic engineering professors and have not been able to find a solution to this problem or where such a device has been or is used. Can you give me any help?

S. McEvoy,
Ozone Park, N. Y.

At our request the following solution was furnished by Walter Ernst, Vice President, Director of Engineering, The Commonwealth Engineering Company of Ohio, Dayton: I do not think that Mr. McEvoy's problem is particularly difficult. It looks to me like a simple application of Bernoulli's Theorem. Bernoulli's Theorem deals with the equivalence of pressure and velocity head. What is done is to convert velocity head into pressure head with the equation

$$V = \sqrt{2gH}$$

V in this case is

$$V = \frac{2\pi nR}{60}$$

$$n = \frac{\sqrt{H} \times \sqrt{2g} \times 60}{2\pi R}$$

$$= \text{speed in rpm}$$

That means that C would be

$$\frac{\sqrt{2g} \times 60}{2\pi R}$$

with R in feet. The exponent m would be 1/2.

Incidentally, this is the pressure

Continued on page 36

Something New in Oil Cooling

heat-x INNER-FIN OIL COOLERS

Longitudinal inner-fin construction, exclusive with Heat-X, makes possible this compact, economical oil cooler. Generous inner-fin surface permits more cooling in less space . . . with minimum pressure drop.

Unequalled for many applications, including hydraulically operated machines, turbines, diesel and gasoline engines, torque convertors, gears, compressors, transformers and similar applications.

Oil flows through the inner-finned tubes, water counterflows through the shell. Available in several sizes, with oil flow rates up to 60 G.P.M.

Inner-finned element is all copper and is easily removable for cleaning or replacement.

"O" rings provide positive seal between oil and water . . . eliminate all soldered and packed joints and gaskets

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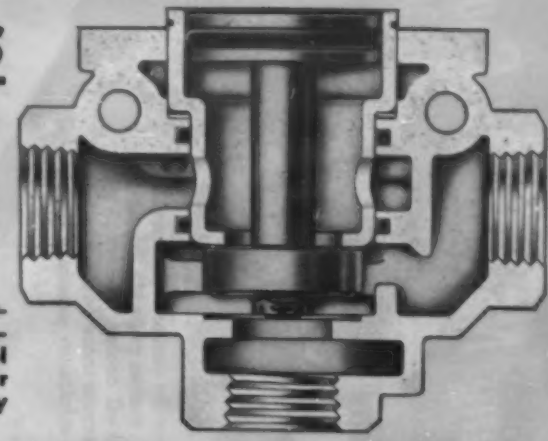
BREWSTER - NEW YORK

HERE'S HANNIFIN'S *P-M Pilot-Master* VALVE LINE!

The Most Versatile Family of Valves Ever Designed and Built for the Directional Control of Air!



Everything you need from the simplest to the most complicated air-operated circuit can be accomplished with these valves. Included are 2-Way, 3-Way and 4-Way Master Valves and solenoid Pilot-Master Valves...direct-operated 3-Way Pilot Valves in a wide choice of operating heads...and a brand-new series of small direct-operated 4-Way valves. Plan now to get acquainted with these fast-acting, full-area control valves...there's a Hannifin representative near you who will introduce you to their many money-saving advantages.

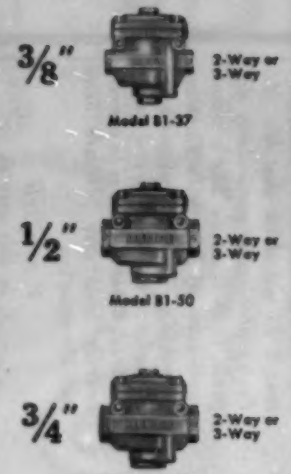
P-M Pilot Valves

Direct-operated 3-Way ¼" (⅜" tapping optional) poppet-type valves for use as "pilot" valves for remote control of P-M Master Valves or direct control of small cylinders.

P-M Master Valves

Pressure operated

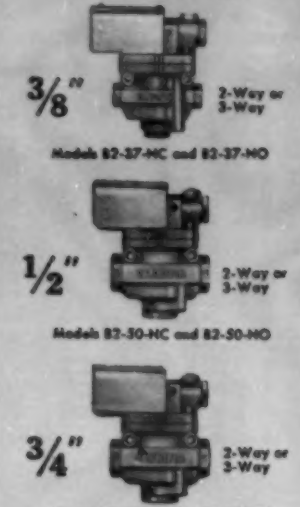
For remote control from a 3-Way P-M Pilot Valve. Series B-1, 2-Way and 3-Way; Series BB-1, 4-Way.



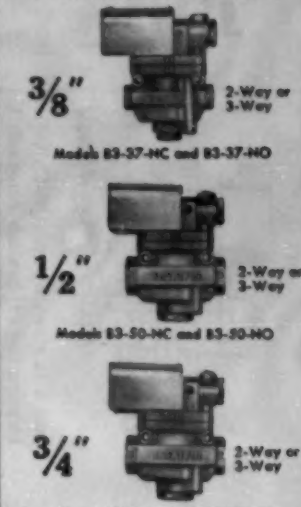
P-M Pilot-Master Valves

Solenoid-controlled by integral pilot heads...

Series B-2, 2-Way and 3-Way spring return type; Series BB-2, 4-Way spring return type.



Series B-3, 2-Way and 3-Way pressure return type; Series BB-4, 4-Way momentary contact type.



Basic P-M Advantages

- Removable cartridge contains piston-poppet. Only moving part of main valve. Springless. Replaceable without disturbing main piping. Two cartridge sizes fit all five valve sizes.
- 2-Way and 3-Way valves operate N.O. (normally open) or N.C. (normally closed). Buy them either way or convert them on the job.
- Interchangeable: Same head fits every size valve body in any given series. Same body fits three different heads in every pipe size.
- Snap action. Speeds of 600 cycles per minute entirely practical with solenoid models.
- For any pressure from 15 to 150 p.s.i., gas or air. Higher pressures permissible when water or oil is the fluid.

P-M Direct-Operated 4-Way Valves

Direct-operated 4-Way ¼" (⅜" tapping optional) poppet-type valves for control of small double-acting cylinders.

CC1-25 Solenoid Spring Return

CC11-25 Solenoid Momentary Contact

CC3-25 Cam Ball Type

CC4-25 Hand Non-Locking

CC5-25 Hand Locking

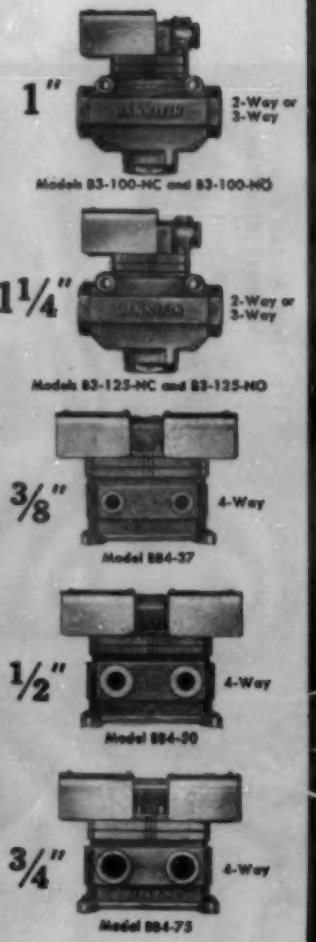
CC7-25 Foot Locking

CC6-25 Foot Non-Locking

CC10-25 Pressure Operated

P-M Pilot-Master Dual 3-Way Valve

Two 3-Way Pilot-Master Valves mounted in common body. Both pilot valves and main valves pneumatically interlocked so unit "fails safe." For completely safe operation of mechanical presses. ¾" and 1¼" sizes.



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April 26-30

BOOTH 827

We'll have on display not only the complete P-M line, but other, still newer Hannifin control valves... If you cannot attend, be sure to write for

BULLETIN 232

...it's the complete P-M Pilot-Master Valve Story and should be in your files.

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Circle 56 on Reader Service Card

How G&K INTERNATIONAL helps Hunter Fan & Ventilating Company keep *Oil* where it belongs

Oil — in the wrong place — can be a problem, particularly on a fan spindle revolving at 1125 rpm.

Hunter Fan and Ventilating Company, Memphis, Tenn., were using a case seal with garter spring as the oil retainer on the spindle of their 24" and 30" Airspread Fans. Since these fans are used in churches, restaurants, auditoriums, industry . . . oil leakage and spattering had to be eliminated.

G&K-INTERNATIONAL engineers suggested the use of a bonded-washer-type oil seal of molded synthetic rubber specially formulated to maintain a close seal under the severe conditions of service. Lower cost and ease of assembly were added attractions . . . in fact, the solution appeared too good to be true! But severe performance tests proved that the G&K-INTERNATIONAL oil seal eliminated oil creep, even when the oil cavity was overloaded.

G&K-INTERNATIONAL is ready to work with your engineers . . . to supply standard and special synthetic rubber packings of all types; also modern leather U's, V's, Flanges, Cups and Oil Seals.

Write for G&K-INTERNATIONAL Catalog and Manual 201-A. 60 pages of up-to-date data including latest JIC and officially recommended sizes for all types of packings.

G&K-INTERNATIONAL *Packings*

GRATON KNIGHT

LEATHER—SYNTHETIC RUBBER

GRATON & KNIGHT COMPANY, Worcester, Massachusetts
INTERNATIONAL PACKINGS CORPORATION, Bristol, N. H.

P-8

Letters to the Editor

Continued

you get when you run a centrifugal pump with the outlet shut off. This assumes there are no losses in the mechanism. If there is a loss in the conversion between velocity and pressure head, this can only be determined by an actual test.

Fluid Motor Application Without Bleed Lines

We are in need of fluid motors to operate in a 1000 psi circuit, approximately 3 gpm capacity, with ½ to 1½ hp output at 1800 rpm. It is impossible to run bleed lines to the reservoir from these motors. If you list a manufacturer of fluid motors that require no bleed lines, please advise.

K. A. Lamb,
John G. Burke & Co.

A fluid motor installation without bleed lines would require a round-about solution. Every fluid motor must have some leakage; without leakage there would be no adequate lubrication of moving parts. This means that there must be a path for leakage back to the reservoir. This path need not be a separate line. One of the main lines from the motor is a return line. If there is no back pressure in the return line, it is possible to connect the motor drain line into the return. If there is a back pressure in the return line, a separate bleed line cannot be avoided. The size and operating characteristics of the motor you require can be furnished by a number of fluid motor manufacturers (see page 156 of the 1954 Directory issue of APPLIED HYDRAULICS).

Directory Errata

A & A Manufacturing Company, 2017 W. Clybourn St., Milwaukee 3, Wis. as an advertiser in the Directory issue should have had their name listed in bold face type on page 191 in the classification Sleeves, Telescopic, Protective.

The Weinman Pump & Supply Company, 317 South Main St.,

Continued on page 40

JUST A twist OF THE wrist

That's all it takes to clean the Cuno AUTO-KLEAN—the strainer that can be continuously cleaned while it's working.

Turning the handle one revolution moves the strainer element through comb blades, removing all dirt from strainer surfaces. Dirt particles fall to bottom of housing, where they can be drained off periodically. Cuno's exclusive combing operation cleans thoroughly—without costly interruption of fluid flow.

- AUTO-KLEAN's permanent metal filter element is available in steel, brass or stainless steel for long trouble-free service under any conditions.
- AUTO-KLEAN is adaptable to any fluid-flow system.
- From acids to tar . . . if you can pump it, Cuno can filter it. Capacities range from one gallon per hour to 3,800 gallons per minute.

A.3.8

CUNO

ENGINEERED FILTRATION

Removes More Sizes of Solids From More Kinds of Fluids

AUTO-KLEAN (disc-type) • MICRO-KLEAN (fibre cartridge) • FLO-KLEAN (wire-wound)

CUNO'S AUTO-KLEAN ENDS NEED FOR STAND-BY STRAINERS

Permanent strainer element saves on maintenance bills

You don't have to use a duplex strainer installation to get dirt and other solids out of your hydraulic fluids. A *single* Cuno AUTO-KLEAN strainer can do the job to your complete satisfaction.

This is possible because fluid flow doesn't have to stop while you're cleaning this strainer. Cuno's exclusive "comb-clean" action provides complete cleaning of the strainer element on the job—*without stopping fluid flow*. Thus, non-stop filtration, with no need for a stand-by strainer.

AUTO-KLEAN really cuts maintenance bills, for there aren't any cartridges to change. Occasional rotation of the handle does the cleaning job. (Most units can be equipped with motor drives for continuous cleaning.) If you want suction straining, AUTO-KLEAN is ideal. You can build it right into your sump, with the handle on the outside.

AUTO-KLEAN's low pressure drop gives full-flow filtration on gravity, low-pressure, high-pressure or suction lines—with no loss in operating efficiency. All solids larger than the specified disc spacing—from .0035" (170 mesh) to .062" (12 mesh)—are stopped by metal strainer discs. You can get standard AUTO-KLEAN filters built to operate at pressures up to 3000 psi.

Send the coupon today for free bulletin.

A.3.15

Cuno Engineering Corporation
Dept. 3515B South Vine St., Meriden, Conn.

Please send me free bulletin on Cuno AUTO-KLEAN strainers.

Name.....

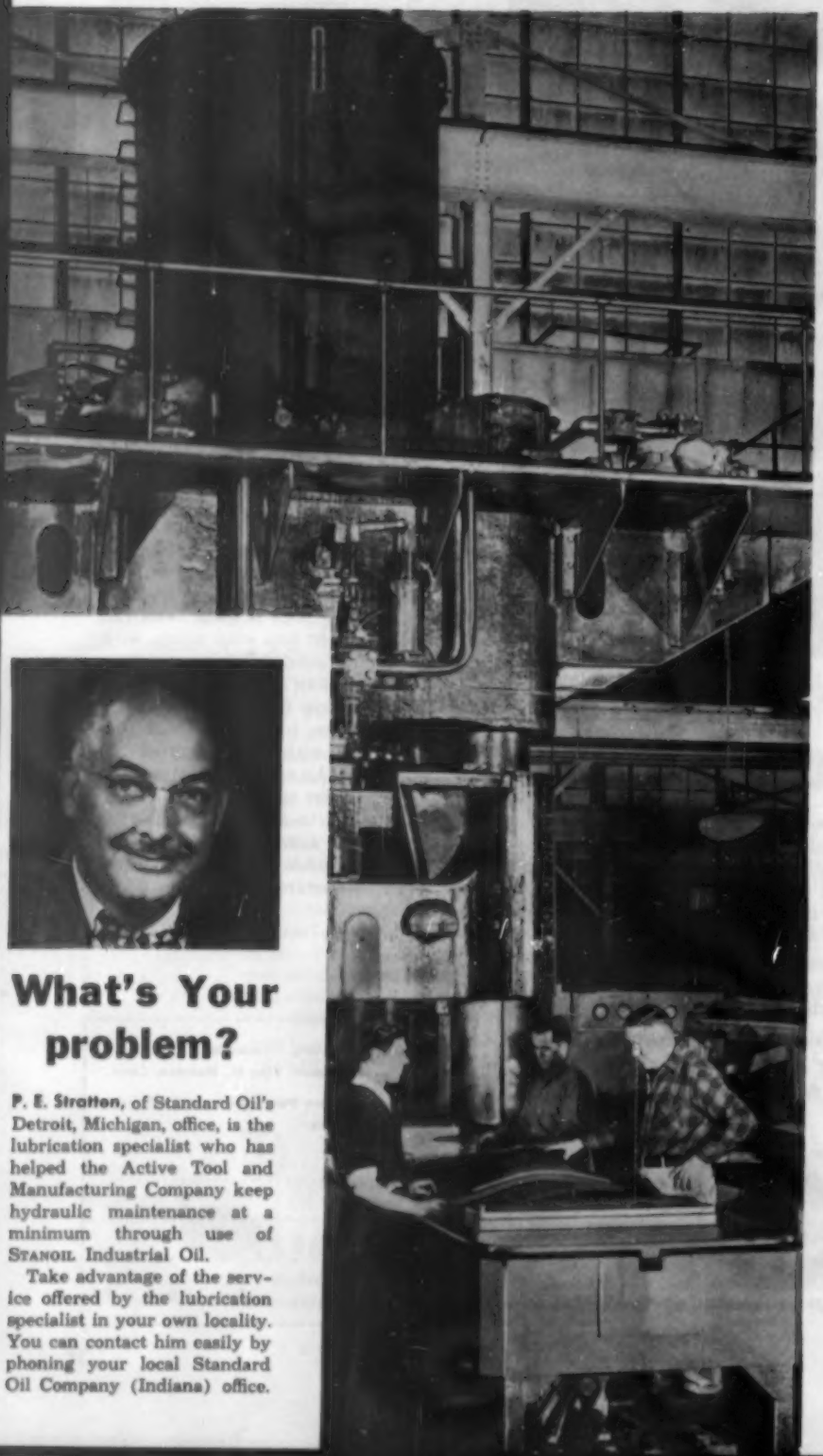
Company.....

Address.....

City.....Zone....State.....

STANOIL
TRADE MARK
Industrial Oil

How they keep hydraulic maintenance to a minimum



● Officials of the Active Tool and Manufacturing Company, Detroit, Michigan, count on trouble-free hydraulic operation of this giant press. They place much of their confidence in the performance of STANOIL Industrial Oil—and with good reason.

Recommended by a Standard Oil lubrication specialist, STANOIL has served in the hydraulic system of this press for over four years. In all of that time, it has not been necessary to replace the original fill of oil nor has the hydraulic system once needed to be cleaned. Periodic tests of oil samples have shown that STANOIL, despite hard service and high oil-operating temperatures, has maintained a lubricating quality comparable with new oil.

You, too, can rely on this unique, versatile oil to give you clean, dependable service, in a wide variety of equipment. The Standard Oil lubrication specialist serving your area of the Midwest will be glad to show you operating records covering the many applications of STANOIL. Phone him at your local Standard Oil office. Or, write: Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Illinois.

What's Your problem?

P. E. Stratton, of Standard Oil's Detroit, Michigan, office, is the lubrication specialist who has helped the Active Tool and Manufacturing Company keep hydraulic maintenance at a minimum through use of STANOIL Industrial Oil.

Take advantage of the service offered by the lubrication specialist in your own locality. You can contact him easily by phoning your local Standard Oil Company (Indiana) office.

STANDARD

STANDARD OIL COMPANY

(Indiana)

a design engineer recently paid us this compliment while examining one of our cylinders. We pass it on to you with the idea that you too may find Pathon cylinders designed right for the job on your cylinder applications.

"It's designed right—just the way I'd do it myself."

As a designer...

YOU GET EVERYTHING YOU WANT IN A HYDRAULIC CYLINDER

Pathon

HYDRAULIC CYLINDERS

are made in eight standard models and can be adapted to practically any application. Write us today for Bulletin No. 22. We're glad to help you on any cylinder problem.

- **COMPACTNESS**
- **LOW STRESS CONCENTRATION**
- **INCREASED STRENGTH ... AND FATIGUE LIFE**

All Pathon Hydraulic Cylinders in Series RH 2000 P.S.I. and QH 1000 P.S.I. use a single screw head to attach the head to the body of the cylinder. This design provides an absolute minimum of physical size and at the same time reduces stress concentration throughout the barrel to the head attaching area. You get a *plus factor* in shock loading with increased strength and fatigue life. Your Pathon Hydraulic Cylinders are simple and sturdy in construction, require much less maintenance.

Pathon AIR CYLINDERS

DIRECTIONAL CONTROL VALVES

We also manufacture a complete line of Air Cylinders and Directional Control Valves. Write for information.

Pathon MANUFACTURING CO.

3823 PACIFIC AVE.

CINCINNATI 12, OHIO

It's No Coincidence That TowmoTorque Control is Oil Powered by HYDRECO

Advanced engineering ideas, like the Towmotor TowmoTorque drive, have joined forces with HYDRECO Oil Power too consistently to be a coincidence.

Of interest to design engineers is the hydraulics problem successfully solved here. The control of the torque converter drive through a specially-designed HYDRECO valve enables the operator to control vehicle speed independently of the hoisting speed. For example, the operator can drive the truck forward and backward very slowly while raising the load at maximum speed. Other HYDRECO components on this truck include a special cylinder and relief valve for the TowmoTorque, and a pump, control valve and cylinder for the hoist circuit.

HYDRECO Oil Power is providing a definite sales advantage to more and more makes and models of mobile equipment, machine tools and special machinery. And, frequently you'll find that the things you're dreaming up are problems already solved by HYDRECO engineers.

The famous HYDRECO Four-Bolt design gear-type Pump for 1000 to 1500 psi applications is the heart of the Towmotor hoist circuit.

A compact HYDRECO cylinder designed with low-friction characteristics actuates the TowmoTorque drive.

This HYDRECO relief valve is used on the torque converter to protect the heat exchanger from excess pressure.

Located beneath the floorboards is the HYDRECO-designed valve, one plunger of which is connected to a hand lever and hydraulically controls the forward and reverse motion of the truck. The other plunger, connected to a foot pedal, controls the vehicle speed regardless of engine speed.

Write

Write for the latest HYDRECO bulletins on Pumps, Motors, Valves and Cylinders.

HYDRECO DIVISION
THE NEW YORK AIR BRAKE COMPANY
1104 EAST 222nd STREET • CLEVELAND 17 • OHIO

Letters to the Editor

Continued

Pittsburgh 20, Pa. is an established builder of hydraulic package power units and should have been listed under the classification, Package Power Units, Hydraulic on page 168 in the 1954 Directory.

Skinner Electric Valve Division of The Skinner Chuck Company, was properly listed in the Manufacturers' alphabetical listing but listed as Skinner Chuck Company under the Product Classifications. These listings should also have been Skinner Electric Valve Division of the Skinner Chuck Company.

Reprints of the 32 page circuit section which appeared in January are available. Single copies 50c; 40c in lots over 50; 35c in lots over 100.

Data List

I am very interested in the applications of hydraulic equipment. Can you send me the names of study books or manuals about hydraulics.

H. HOEPNAGEL,
Aalkeestraat 17B,
Rotterdam, Netherlands

A copy of the current edition of APPLIED HYDRAULICS Data List, a short bibliography of leading manuals, handbooks and major catalogs in the hydraulic, pneumatic and associated fields has been sent to you. This list is prepared annually. The 1954 Data List is expected to be ready about May 1; for the first time a list of training films will be included. Individual copies will be sent on request.

Hydraulically Operated Chuck Wrench

We are looking for a power wrench to operate a three jaw, self centering chuck. A similar chuck wrench, operated electrically is manfactured by the Cushman Chuck Co. Many of our machines are equipped with hydraulics to operate the tooling and we feel that it would be more practical to have

a hydraulically operated wrench for the chuck.

CLARENCE A. DUFFANY,
The Hall Planetary Co.
Philadelphia, Pa.

The Cushman Chuck Company also makes a power operated chuck, using air as the power source. Our file does not turn up a manufacturer who makes a hydraulically operated wrench as a standard item. For sources that might build such a wrench as a special item, check with your hydraulic equipment vendors. There are a number of leading sales-engineering representatives in your area.

J. I. C. Standards

Would you have available a complete listing of J.I.C. Standards for hydraulic, electrical, lubrication and pneumatic? If not, perhaps you could tell us where we might be able to obtain such copies.

F. VAN HAFTEN,
Engineering Dept.,
Leitelt Iron Works
Grand Rapids, Mich.

Individual copies of J.I.S. Standards for electrical, lubrication, hydraulic and pneumatic industrial equipment may be obtained from Joint Industry Conference, Box 182, Northend Station, Detroit, 2, Mich. The Standards are available separately.

Source for Flowmeter

Will you please give me the address of the manufacturer of the turbine type flowmeter mentioned on page 78 of your November 1953 issue.

F. S. WARTMAN
Titanium Research Section
U.S. Dept. of the Interior
Bureau of Mines

Potter Aeronautical Company, Newark 2, New Jersey is the manufacturer of the flow sensing element used in the flowmeter described in the article. Brown Instrument Division of the Minneapolis-Honeywell Regulator Company, 7th & Orange, Olney, Philadelphia, Pennsylvania build and sell the entire instrument.

the ALL Way Balanced Dual-Vane

DUDCO

HYDRAULIC PUMP

Featuring starting torques higher than running torques, DUDCO has long been recognized as the most efficient Fluid Motor in the field. Standard models from 180 lb. in. to 14,400 lb. in.

One look at the inside of a DUDCO Pump tells the story of efficiency through *fully* balanced construction. Note how, at all times, the Dual-Vanes provide a *double* barrier to slippage and lost power. These DUDCO Vanes are individually balanced to closely follow the cam ring contour without wear-producing thrust . . . their unique displacement action provides an extra 15% to 20% added volume.

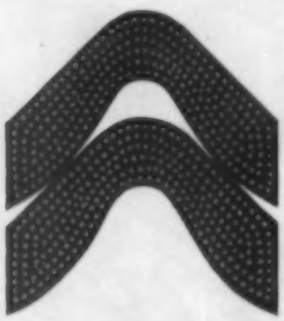
Smooth, non-pulsating DUDCO power, delivering 2000 psi for continuous operation, frequently doubles the capacity of less efficient hydraulic circuits. Standard models from 3 gpm to 120 gpm.

DUDCO DIVISION
THE NEW YORK AIR BRAKE COMPANY
1704 EAST NINE MILE ROAD • HAZEL PARK • MICH.

2 BIG REASONS

WHY R/M VEE-FLEX® IS AMERICA'S MOST COPIED PACKING

1



Its homogeneous construction makes it highly pressure-resistant

R/M Vee-Flex is a superior seal against the high pressures typical of hydraulic applications. The reason is its exceptionally deep and thorough compound penetration. If you cut into the packing with a knife, you wouldn't find any bits of white material. This complete penetration also stops the wicking action of oil—enabling the packing to resist swelling. Five types of R/M Vee-Flex seal, without extruding, for a range of pressures up to and in excess of 6000 psi.

2

Its design makes it self-sealing, self-adjusting

The surface of each R/M Vee-Flex Ring is convexly curved where it touches the next ring. When the hydraulic pressure stroke occurs, this construction produces an automatic seal laterally against the stuffing box wall and longitudinally against the next ring. That these actions take place has been conclusively proved by means of photoelastic analyses and of radial pressure tests at the Franklin Institute Laboratories for Research and Development.

If you are packing pumps, valves, rams, presses, cylinders, accumulators or other hydraulic equipment, you need R/M Vee-Flex. There is a type available for every service—air, gas, steam, oil, water, food products, etc. Write for R/M Vee-Flex Bulletin giving complete data and table of sizes.

R/M PACKINGS
RAYBESTOS-MANHATTAN, INC.
PACKING DIVISION, MANHEIM, PA.

FACTORIES: Bridgeport, Conn.; Manheim, Pa.; No. Charleston, S.C.; Passaic, N.J.; Neenah, Wis.; Crawfordsville, Ind.; Peterborough, Ontario, Canada

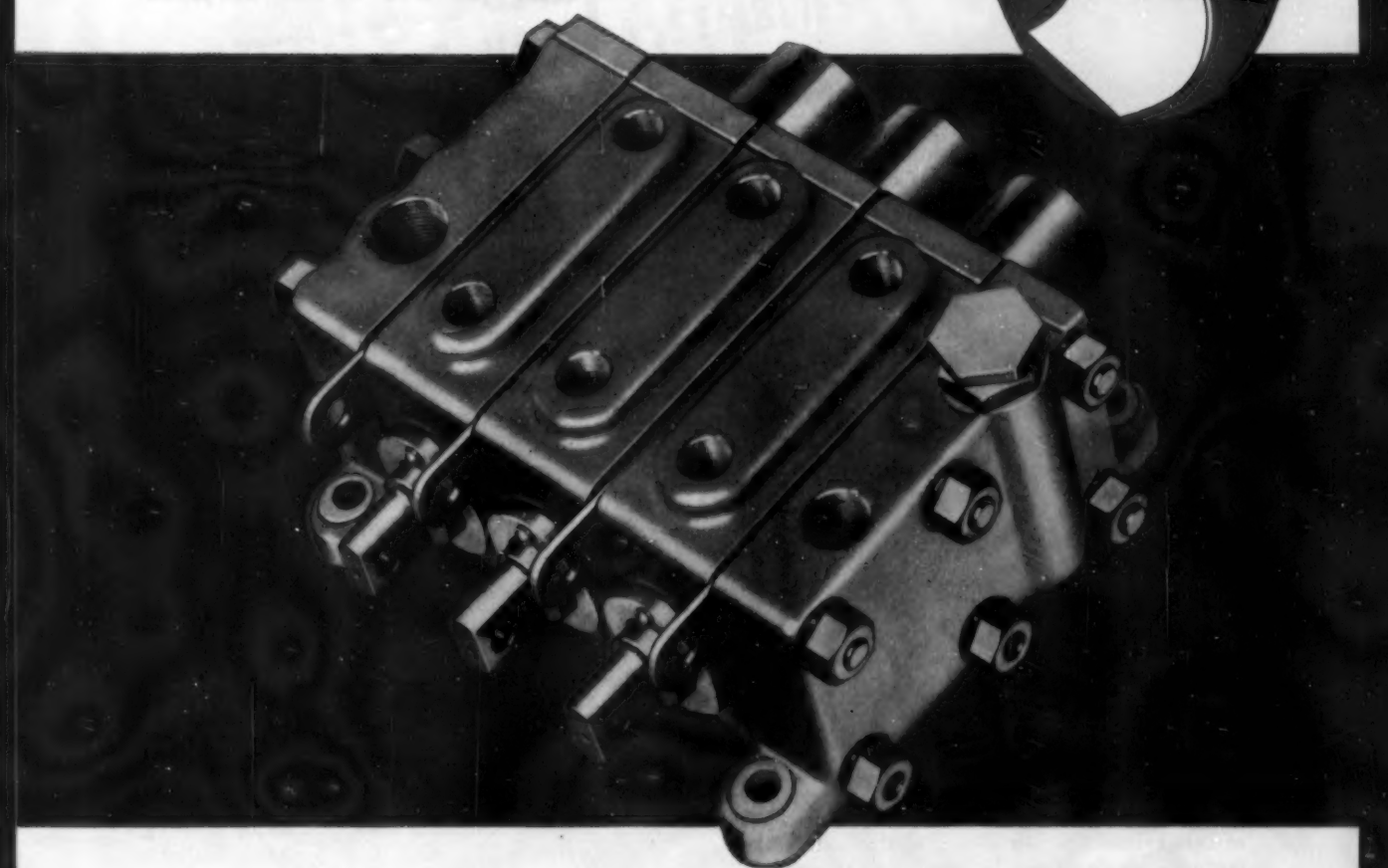
RAYBESTOS-MANHATTAN, INC., Packings • Asbestos Textiles Industrial Rubber, Engineered Plastic, and Sintered Metal Products • Abrasive and Diamond Wheels • Rubber Covered Equipment • Brake Linings • Brake Blocks • Clutch Facings Fan Belts • Radiator Hose • Bowling Balls

Circle 101 on Reader Service Card

Circle 118 on Reader Service Card

NEW! Improved SERIES TYPE Valve eliminates load drop, assures positive control

SUNDSTRAND



Here's the answer to your multiple control problems on all types of hydraulically actuated equipment. With this new, improved Sundstrand *Series Type* Valve, you can control any number of cylinders or fluid motors one at a time or two or more simultaneously. The series construction, for example, permits vertical, horizontal and rotary movements at the same time. Since the valve is made up of individual sections, it can be furnished with up to ten controls in a single, compact assembly. Other design features include precise location of lands and grooves, which does away with check valves . . . eliminates load drop and assures positive controlled action at all times. Large, direct flow passages minimize velocity and pressure drop . . . resulting in 80% more usable pressure. Working members receive only pressure necessary for actuation . . . no undue stress exerted on operating parts. Spools hardened and ground . . . perfectly balanced to prevent sticking. Internal leakage eliminated by a long seal path . . . external leakage remedied by lathe-cut neoprene washers between sections. Adjustable for pressure relief between 500 and 1500 psi. Available in ½" and ¼" sizes. For further information write for Bulletin No. 3103-1.

SERIES CONSTRUCTION—
permits control of two or more components simultaneously

LARGE FLOW PASSAGES—
minimize pressure drop

LONG SEAL PATH—
reduces leakage

PERFECT SPOOL BALANCE—
prevents sticking

SUNDSTRAND MACHINE TOOL CO.
Hydraulic Division, Rockford, Illinois

SUNDSTRAND

A name to remember in **INDUSTRIAL HYDRAULICS**

USEFUL LITERATURE

You'll find many valuable production and design ideas in publications described here . . . copies will be sent you free without obligation

GEAR TYPE PUMPS . . . with positive displacement are described in a folder GPI 852 PL5, released by Webster Electric Co. A few of the applications for these pumps are, pressure lubricating, oil circulating, oil filtering and oil transfer. They can be adapted to a wide range of uses. Both the face or wet sump mounting and the sealed unit types are presented. An internal relief valve is available for all pumps. Relief valve pressures may be varied between 50 and 200 psi. This is accomplished by a manual adjustment. Relief valves replace standard covers. The dimensional variations are also shown.

Circle 211 on Reader Service Card

AIR AND HYDRAULIC CYLINDERS . . . for 150 psi air and 300 psi oil are described in catalog No. 701 issued by Hydraulic Power Division, The Hydraulic Press Mfg. Co. A few of the subjects presented covering the model 300 series cylinder are: an illustrated index of the entire series; features and cut-away illustrations; all mountings available, including foot, side lug, subplate, centerline, clevis, base, flange and trunnion and many more; large bore cylinders, single acting cylinders, special air and hydraulic cylinders, all of which gives a very complete picture of this cylinder series. Many of the construction features are described in detail. In the section of the catalog devoted to mountings, every dimension of interest is given.

Circle 212 on Reader Service Card

RUBBER "O" RINGS . . . injection molding of silicone rubber products is described in new literature issued by Minnesota Rubber and Gasket Co. The literature defines the properties and applications of silicone rubber together with suitabilities of the material regarding specific types of products.

Circle 213 on Reader Service Card

MAGNETIC CONTACTORS . . . Federal Electric Products Co. has issued a new booklet, Bulletin 501 & 502, describing and giving complete information on magnetic contactors. They are designed to provide a safe, dependable means for repeated quick closing and opening of the electrical circuits controlling the sequence of operations in modern multiple action machines. They are electric switches in which the make and break action is controlled by an electro-magnet and are used for resistance loads as well as for electric motor loads where overload protection is not required or provided. They are available up to 600 amperes or 400 hp.

Circle 214 on Reader Service Card

SLIDE CHART . . . giving facts on steel casting material selection has been developed by Lebanon Steel Foundry. It gives reference data on 19 carbon and low alloy grades and 17 stainless and corrosion-resistant grades in regular production. By adjusting the guide arrow at the proper grade under consideration, windows in the chart reveal the nominal analyses, the minimum mechanical properties and the heat treatment of the grade. Other pertinent information is also given.

Circle 215 on Reader Service Card

HYDRAULIC DRIVE . . . provides speed control over wide ranges for any application where variable speed is needed. Rockwell Manufacturing Co. Hydraulic Division has released Bulletin No. 101 on this subject. The drive consists of a pump delivering oil under presure to one or more hydraulic motors. The fluid stream to the motor is controlled by the positioning of a four-way distributing and reversing valve. The valve is automatically positioned by a governing system to maintain a constant predetermined speed.

Circle 216 on Reader Service Card

FLARELESS TUBE FITTINGS . . . consisting of only three parts are described in Bulletin F-10-B offered by Industrial Fitting Corp. Complete catalog data is given as to type, material, part number and price. Available in steel, brass, aluminum alloy and stainless steel. Suitable for heavy or thin wall tubing, the fitting provides a large area contact with the tube to dampen vibration. The fittings meet J.I.C. hydraulic standards.

Circle 217 on Reader Service Card

For more Reviews of Free Literature turn to page 129

Circle 40 on Reader Service Card ⟶

HYDRAULIC POWER
DELIVERED THROUGH
Eastman
HYDRAULIC HOSE ASSEMBLIES

•

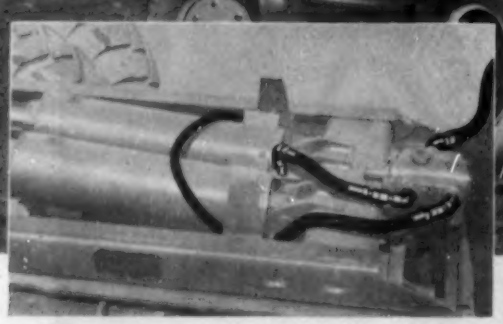
TILTS 30 TON LOAD 70° IN 21 SECONDS

The Heil "High Angle" Hoist shown here is capable of elevating a 30-ton rock load 70° in 21 seconds . . . cutting overhead, time and operating costs by quick, clean unloading in "round-the-clock," quarry operation.

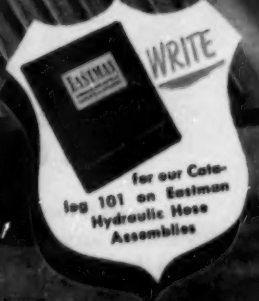
Heil Truck Bodies and Hoists, known for their quality, durability and sound engineering—are likewise equipped with *quality* Hydraulic Hose Assemblies—by EASTMAN of Manitowoc, Wis.—first in the field of modern hydraulic power application.

Protect the performance of *your* product by relying on the high standards of quality and workmanship in EASTMAN Hydraulic Hose Assemblies. Safeguard *YOUR* Lifelines of Mobile Power, too!

SAFEGUARDING INDUSTRY'S *Lifelines of Mobile Power*

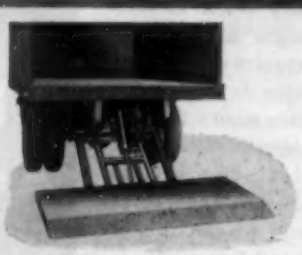


The tremendous lifting power of the Heil Hoist is obtained through twin cylinders and extremely powerful linkage—with only 1000 psi delivered through Eastman Hydraulic Hose Assemblies.



for our Catalog 101 on Eastman Hydraulic Hose Assemblies

Eastman
first in the field
MANUFACTURING COMPANY
Dept. AH4, Manitowoc, Wis.



Anthony Lift Gate

Anthony Lift Gate, built by pioneer company in truck lifts—equipped by Eastman, pioneer in hydraulic hose assemblies. Up to 4000 lbs. lift.

Drott Skid Shovel

Drott Skid Shovel, built for International, equipped with Eastman Hydraulic Hose Assemblies. Lift capacity —4000 lbs. Breakout force—11,500 lbs.

Now you can make tube and pipe connections at 1000 psi and above

NO FLARING

NO THREADING, NO WELDING, NO SOLDERING

with Weatherhead

"ERMETO"®

TUBE CONNECTORS

AVAILABLE FROM INDUSTRIAL DISTRIBUTORS COAST TO COAST

Filling Industry's Toughest Requirements Makes *Quality* a Weatherhead *Habit*

Research in *vibration* has taught us how to distribute loads and minimize stress points. Research in *high pressure* has taught us the design and metallurgical factors which mean safety up to 60,000 psi. Constant laboratory work at *high and low temperatures* has taught us what to expect in joints under all temperature conditions. Serving the needs of many specific industries has aided us in developing connectors for use even where *corrosion* is a problem.

This knowledge, as it helps solve special applications where demands are severe, is promptly applied to design and production of *all* connectors in the Weatherhead line.

The Mark of Quality

WEATHERHEAD

FIRST IN HYDRAULIC CONNECTIONS

Plants : Cleveland and Antwerp, Ohio; Syracuse, Angola and Columbia City, Indiana; and Glendale, California.

Warehouses : Ft. Wayne, Indiana; and Glendale, California.

Here is the principle of Weatherhead's patented Ermeto connector

Line-to-line seal between tube and cutting edge of patented ERMETO sleeve.
Line-to-line seal between ERMETO sleeve and fitting body.

Now you can get a positive, leakproof, vibration-resistant seal for any pressure —low to extremely high—*using only a wrench.*

With the patented Ermeto design, the case-hardened sleeve actually shears a groove into the outer surface of the tube and bows when the nut is tightened. This cutting and bowing action assures a positive seal . . . a joint that can be disassembled and reassembled over and over again.

Designed for high-pressure use, Ermeto connectors have simplified tube connections and cut costs so successfully that many manufacturers are standardizing on ERMETO FOR ALL JOINTS. The advantages in terms of simplified inventories are obvious. Ermeto connectors are made in steel, stainless steel and Monel, in sizes from ⅛" to 2" O. D.

ERMETO MEETS J. I. C. REQUIREMENTS

DESIGN ENGINEERS can forget psi when they specify ERMETO! It is admirably suited for high pressures and high-frequency vibration uses.

PRODUCTION AND MAINTENANCE ENGINEERS find Ermeto saves time! Fast and easy to install because a wrench is the only tool that's needed. Readily disassembled and reassembled, over and over again ... always insuring a pressure-tight joint ... eliminating hydraulic oil losses.

YOU CAN GET DETAILS NOW by writing for Ermeto Catalog E-1457. Also available: Catalog F-1456 on brass fittings, Catalog H-1451 on Weatherhead industrial hose and reusable couplings. *Address—The Weatherhead Company, Dept. A, 300 East 131st Street, Cleveland 8, Ohio.*

No Single Hydraulic Oil Fits All Operating Conditions Economically

That's why Sun makes a variety of oils to give top performance and economy in any system

The selection of the right hydraulic oil is determined by many factors, such as average operating temperature; rate of leakage; contamination caused by cutting fluid, water and dirt. *No single oil will meet all combinations of conditions economically.* It's sensible, therefore, to choose a hydraulic oil with care . . . to be sure that it will give top performance at lowest possible cost. Consult your local Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Department AH-4.

INDUSTRIAL PRODUCTS DEPARTMENT

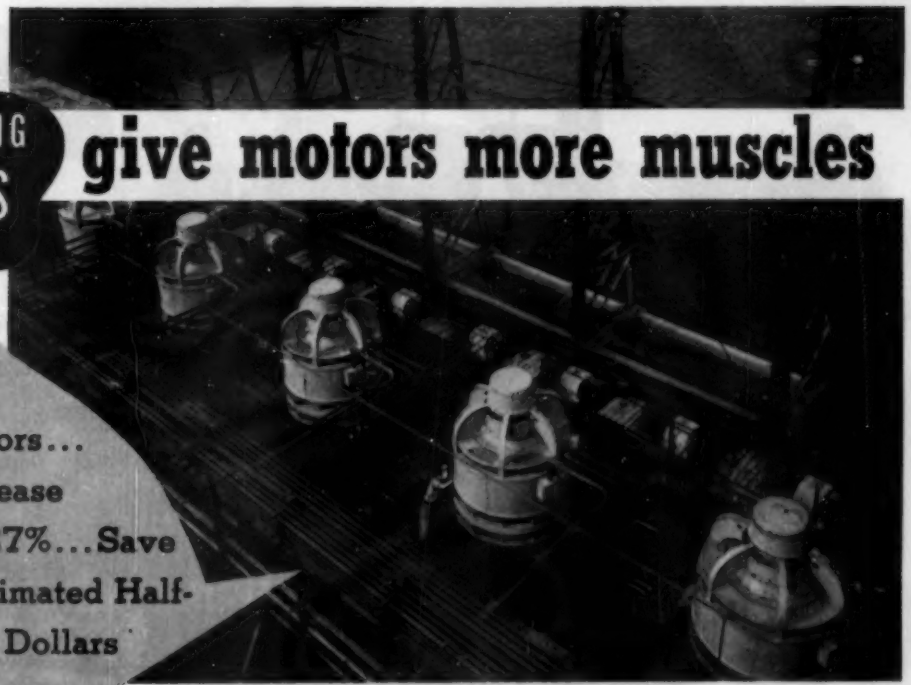
SUN OIL COMPANY

SUNOCO

PHILADELPHIA 3, PA. ◆ SUN OIL COMPANY LTD., TORONTO & MONTREAL

DOW CORNING
SILICONES

give motors more muscles



Uprate pump motors... increase capacity 27%... Save an Estimated Half-Million Dollars

Much of the sea water pumped into The Dow Chemical Company's famous "magnesium from the sea" plant in Freeport, Texas, is handled by six 71,000 gpm centrifugal pumps. Each pump is direct-driven by a 300 hp, 277 rpm motor. The entire line of motors is mounted on a massive underwater concrete foundation.

Recently Dow's plant expansion program reached the point where a pumping capacity of 90,000 gpm per unit was required. That capacity could be reached by 450 hp motors operating at a higher speed. But conventional motors rated at 450 hp would be almost half again as large, and much heavier than the existing units. Extensive changes in mounts, brackets and other fittings, as well as reinforcement of the underwater foundations would be required. Estimates of the cost of reinforcing the foundations alone ran as high as a half-million dollars. And that's not counting the cost of the new motors or the fact that the work would have to be done all at once, shutting off the intake canal and all but halting plant production.

Dow engineers solved the whole problem at minimum cost by having the motors rewound, one at a time, with silicone (Class H) insulation to develop 450 hp at 327 rpm. Capacity of each pump was increased to 90,000 gpm without any further modification of the installation.

An extra advantage of Class H insulation was demonstrated when one of the motors was removed to correct a shaft rub that had developed at the upper seal. This same motor had also developed a small leak in its upper housing. When the motor was disassembled, the bottom ends of the coils were found to be immersed in 25 gallons of rain water. And still the silicone insulated coils remained in good operating condition.

That's the kind of performance that has convinced management, maintenance and design men that they get maximum life and reliability at minimum cost when they specify Class H insulation made with Dow Corning silicones for hard-working motors, transformers and other electrical equipment.

You can also reduce to a minimum motor outages due to bearing failure by using Dow Corning 44 Grease

In open and single shielded bearings designed for high temperature operation, Dow Corning 44 has 8 to 10 times the life expectancy of conventional greases. It gives life-time lubrication in permanently sealed bearings.

first in silicones

DOW CORNING CORPORATION

MIDLAND, MICHIGAN

mail this coupon today!

Dow Corning Corporation, Dept. DK-16, Midland, Michigan

Please send me

- ☐ More performance data on Class H
- ☐ List of Class H rewind shops
- ☐ List of Class H Motor and ☐ Class H Transformer Manufacturers
- ☐ "Tall Tales and Fabulous Facts" about silicone products

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

ATLANTA • CHICAGO • CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEW YORK • WASHINGTON, D.C. (SILVER SPRING, MD.)

Canada: Dow Corning Silicones Ltd., Toronto • Great Britain: Midland Silicones Ltd., London • France: Cie. St. Gobain, Paris

ANOTHER

HEAVY DUTY

HYDRAULIC APPLICATION

SOLVED WITH

ROPER PUMPS

Series F Pump . . . for pumping clean liquids of all kinds. Pressures to 300 P.S.I. — sizes 1-300 G.P.M.

SPECIAL HYDRAULIC APPLICATION USING STANDARD ROPER SERIES "F" PUMPS

THE PROBLEM: Develop a centralized hydraulic power unit to operate large elevators and hydraulic pushers through a continuous heat treating and annealing furnace in a steel mill.

THE ANSWER: The enormous hydraulic unit shown; as designed and built by Weinman Pump and Supply Co. of Pittsburgh.

This is but one of many special units developed by Weinman. And, here again, Roper Pumps were selected as integral parts of the complicated power system. Roper Series F Pumps are particularly adaptable to this and other applications because of their four-port design for ease of installation and their unusual *dependability* and *long life*.

You, too, can capitalize on improved performance records by including Ropers as original equipment. Our men in the field will be glad to give you all the assistance you need in the selection of the most suitable size pump for the job.

ROPER *Rotary Pumps*

SEND FOR CATALOG 954

Features the complete Roper line

GEO. D. ROPER CORPORATION

704 Blackhawk Park Ave., Rockford, Illinois

Free Literature Offered In this Month's Ads

For more information circle numbers on the reader service card bound in this issue.

Engineering information and specifications on Electro Products Laboratories' new PROXIMITY PICK-UP TRANSDUCER is available in bulletin form. This device actuates electronic or electro-mechanical instruments.

Circle 42 on Reader Service Card

Chicago Rawhide Manufacturing Company will send you literature on PACKING MATERIALS. "Engineering with C/R Oil Seals" and "Report on Conpor" will give you a starting point for solving your sealing problems.

Circle 30 on Reader Service Card

An up-to-date 60 page catalog and manual No. 201-A which includes latest JIC and officially recommended sizes for all types of PACKINGS may be obtained from Graton & Knight Co. Included also are standard and special synthetic rubber packings of all types.

Circle 52 on Reader Service Card

If you would like additional information on custom-made PISTON PACKINGS, it can be secured from Johns-Manville.

Circle 69 on Reader Service Card

For complete details on using BRAKE MOTORS in your operation, write the Howell Electric Motors Co. for Bulletin BR-1. For use in those applications where rapid stopping of rotation is required. This is accomplished with disc brakes, integrally mounted.

Circle 62 on Reader Service Card

Both one-way and two-way shut-off QUICK-CONNECTIVE FLUID LINE COUPLINGS are described in a catalog offered by The Hansen Manufacturing Co.

Circle 57 on Reader Service Card

Continued on page 52

ANCHOR

ONE-WIRE BRAID HOSE ASSEMBLIES

for medium-and low-pressure service

Factory-assembled to your specifications—you get just what you need.

Long, uniform, positive grip assured by internally-threaded coupling shell.

Eliminates leaks and blow-offs in medium- and low-pressure service.

Sizes and types for every application — available with solid male or union male ends.

"O" ring seals prevent leakage between swivel ends and the coupling body.

Use of swivel male ends eliminates need for adapter unions, reduces the number of joints, and lets hose assume normal position when pressure is applied to the line.

Exclusive Anchor Max-Flo coupling gives you the equivalent of unrestricted flow through the couplings.

NEW!
REVOLUTIONARY
ANCHOR FLANCO
SPLIT-FLANGE CLAMP
Positive leakproof connection without threaded joints. Bolt centers are located to distribute the forces evenly and prevent jolting of the clamp halves. Easy to assemble with small automotive-type wrench.

• • •

Get more information. Attach coupon to your letterhead and mail today!

ANCHOR COUPLING CO. INC.

Main Office and Factory: LIBERTYVILLE, ILLINOIS

FACTORY BRANCHES: DETROIT, MICHIGAN • DALLAS, TEXAS

Anchor Coupling Co. Inc.
Dept. AH-44, Libertyville, Illinois
Yes, I'm interested in
☐ Anchor one-wire braid hose assemblies
☐ New Anchor Flanco Split-flange clamp-type coupling
Send me information.

Name..... Title.....

Company Name.....

Company Address.....

City..... ( ) State.....

D-17

The "Packing Package" No Hydraulic Fluid Can Attack

● Chem-o-green TEFLON Back-up Rings

● Chemiseal Synthetic Rubber "O" Rings

Chem-o-green Back-up Rings—made of duPont chemically impervious TEFLON—answer the "O" Ring extrusion problem. Three types—solid rings, split rings and the popular spiral rings for quick, easy installation.

- Eliminate chemical inspection.
- Zero swelling in hydrocarbons and newer synthetic fluids.
- Service temperature range from minus 110°F to 500°F.
- Waterproof, non-flammable.
- Requires no water-soak for installation.
- Unsurpassed anti-friction properties.

Chemiseal "O" Rings—a complete line of homogeneous synthetic rubber packings made in both AN and commercial compounds.

Both a "packing package", made in all standard sizes for "O" Ring gasket, packing and universal tube fitting services.

Take advantage of one source and one responsibility for this important "packing package". Write for Bulletin OB-1152.

UNITED STATES GASKET COMPANY

CAMDEN 1 • NEW JERSEY

FABRICATORS OF duPont TEFLON, Kellogg KEL-F AND OTHER PLASTICS

Representatives in Principal Cities Throughout the World

Circle 126 on Reader Service Card

Free Literature Offered in this Month's Ads

Continued

Descriptive bulletin may be obtained from the Hilliard Corp. on their OIL FILTERS and OIL RECLAIMER units. Oil is kept clean by removing products of oxidation, acids, sludge and moisture.

Circle 59 on Reader Service Card

The efficiency of your hydraulic equipment can be increased. Hon-an-Crane Corp. is offering an 8 page bulletin on HYDRAULIC OIL PURIFIERS and WATER-OIL SEPARATORS, describing the operation of these units and how they can prevent excessive wear.

Circle 60 on Reader Service Card

Do you have a SWITCH problem or need a special application? Engineering Bulletin EM-51, offered by The National Acme Co. can be of service to you. Covered in the bulletin is a heavy duty limit switch for use in new plant automation plans.

Circle 86 on Reader Service Card

By writing Pesco Products Div., Borg-Warner Corp., full information can be secured on HYDRAULIC PUMPS and MOTORS, controls, valves and electric motors.

Circle 97 on Reader Service Card

Catalog 954 features the complete Geo. D. Roper Corp. line of HYDRAULIC PUMPS. These gear pumps are built in a wide range of capacities and maximum operating pressures to 1000 psi.

Circle 106 on Reader Service Card

BOOST PUMPS capable of boosting 100 psi air pressure to 10,000 psi fluid pressure, are offered in literature by Sprague Engineering and Sales Corp. Eight standard models for output fluid pressures of 1000 to 30,000 psi are included with special models for lower or higher pressures.

Circle 113 on Reader Service Card

Continued on page 54

DON'T TAKE CHANCES...

Use Celanese*

LINDOL* HF

the flame-resistant hydraulic fluid

PROVED IN 10 YEARS OF DIE-CASTING APPLICATIONS

- chemically stable
- non-volatile
- odorless
- low pour point
- non-corrosive
- excellent lubricant

Lindol HF—with over 10 years of on-the-job experience—provides an extra margin of safety for operators of hydraulically-activated machines. More and more plant managers today depend on Lindol HF to minimize the hazards of line breaks, leakage caused by vibration, and other mechanical failure.

Developed by Celanese, pioneer in flame-resistant fluids, lubricants, and additives, Lindol HF remains stable at the highest temperatures. It is unaffected by customary thermal and mechanical stresses . . . yields no obnoxious fumes since it contains no chlorine, nitrogen or inorganic salts.

Only minor adjustments, at most, are needed for immediate switchover to Lindol HF—in die-casting equipment, couplings, rams, presses, welding or riveting machines. Write for detailed bulletin.

Celanese Corporation of America
Chemical Division, Dept. 588-D
180 Madison Avenue, New York 16, N. Y.

CELANESE® LINDOL® HF

Appearance	Clear
Specific Gravity 20/20° C	1.160 ± .008
Boiling Range @ 10 mm. Hg. °C	255-295
Volatility, 6 hrs. @ 100° C, % max.	0.1
Flash Point, °F Tag open cup	440-465
Fire Point °F Cleveland open cup	685
Auto Ignition Temperature, °F	over 1100
Viscosity Range, Seconds Saybolt Universal @ 25° C	240-325
Pour Point, °C	—25 to —30
Weight, lbs./gal. @ 20° C	9.7

Celanese® CHEMICALS

*Reg. U. S. Pat. Off.

You can have DRY AIR with exact moisture control

ASSEMBLING ELECTRONIC PARTS

FOR YOUR COMFORT
FOR YOUR PROCESS
FOR TESTING MACHINES OR MATERIALS AT ANY TIME OF THE YEAR

PACKAGING FOOD PRODUCTS

● This Niagara "Controlled Humidity" method gives you the **MOST EFFECTIVE** Air Conditioning because its cooling and heating functions are made completely separate from adding or taking away moisture. This assures you always a precise result. No moisture sensitive instruments are needed.

MOST FLEXIBLE. You can reach and hold any condition in response to instrument settings, or vary it as you wish.

EASIEST TO TAKE CARE OF. The machine is accessible, the control circuits are simple and easy to operate, and there are no solids, salts or solutions to be handled.

MOST COMPACT. It does a very large amount of work in a small space.

INEXPENSIVE TO OPERATE. At normal atmospheric temperatures (unlike systems that use refrigeration to dehumidify) it needs no summer re-heat.

DRYING INDUSTRIAL MATERIAL

Write for Bulletins 112 and 122

NIAGARA BLOWER COMPANY

DEPT. AH, 405 LEXINGTON AVE. NEW YORK 17, N. Y.

Niagara District Engineers in Principal Cities of U. S. and Canada

Free Literature Offered in this Month's Ads

Continued

"O"RING catalog No. 5100 and CUSTOM-MOLDED RUBBER catalog No. 5201A1 are offered by The Parker Appliance Co.

Circle 95 on Reader Service Card

There's a type and size of CYLINDER to match your need. A bulletin covering a complete line is offered by Anker-Holth, Div. of The Wellman Engineering Co.

Circle 14 on Reader Service Card

Literature and full particulars on SMALL CAPACITY PUMPS can be obtained from Gerotor May Corp. The pumps can be obtained with an extended shaft to operate another pump and can be used to rotate in either direction, clockwise or counterwise.

Circle 51 on Reader Service Card

Answers to your DIRECT DRIVE problems for hydraulic pumps are given in a catalog available from Ajax Flexible Coupling Co., Inc.

Circle 7 on Reader Service Card

Bulletin P-5312 has full details on ELASTOPLASTIC PLUGS and CAPS, manufactured by S. S. White Plastics Div., Dental Mfg. Co. Sample plugs and caps can be furnished.

Circle 137 on Reader Service Card

A new brochure containing detailed information on aircraft HYDRAULIC and PNEUMATIC CONTROL equipment, HEATER, ANTI-ICING and FUEL SYSTEM equipment is available from Adel Division, General Metals Corp.

Circle 2 on Reader Service Card

Complete details on leakproof V-RING PACKINGS can be obtained, in literature from Linear, Inc.

Circle 77 on Reader Service Card

Continued on page 56

POWER

THEN and NOW...

RECIPROCATING ROTARY POWER

BONNOT *Hydromotor*

Hydromotor is being used successfully on diverse classes of materials handling equipment, with emphasis on cranes and hoists; on marine machinery • aviation equipment • foundry equipment • machine tools • valves • power presses • printing machinery • steel mill equipment and for scores of other applications.

Hydromotor is a hydraulic actuator that uses any hydraulic medium . . . provides instant, smooth, positive manipulation . . . a dependable source of **reciprocating rotary power** . . . compact, lightweight, requiring minimum maintenance. Instant full torque in either direction through any arc up to 280° is developed.

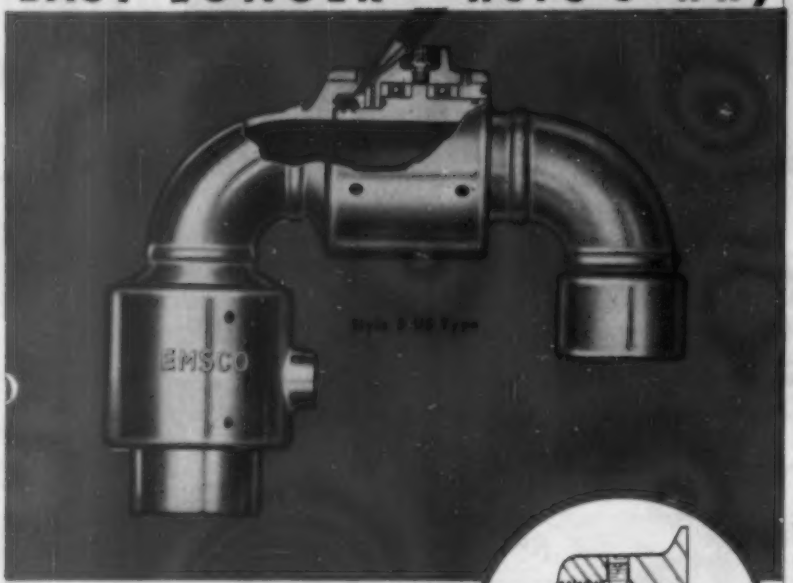
Many present operations in your plant or product requiring high-torque **reciprocating rotary power** can use the Hydromotor to advantage. Standard models develop 150 to 230,000 inch-pounds torque at 1000 p.s.i. Double vane units produce double torque without size enlargement where 100° or less travel will serve. Additional sizes—LARGER AND SMALLER—are constantly under development, **so why not submit details of your needs?**

Bulletin 521 offers application and engineering data. Write for a free copy—or outline your requirements. Name of nearest agent on request.

Hydromotor DIVISION

THE BONNOT COMPANY • CANTON 2, OHIO

EMSCO SWIVEL FITTINGS LAST LONGER — here's why



GROOVED PACKING
Type US for high temperature or Corrosive Service.

UNIQUE DESIGN PERMITS EASY MAINTENANCE WHILE IN OPERATION

Three basic advantages of the Emsco Ball Bearing Swivel Fitting are:

1. FREE TURNING
2. EFFICIENT PACK-OFF
3. LONG LASTING

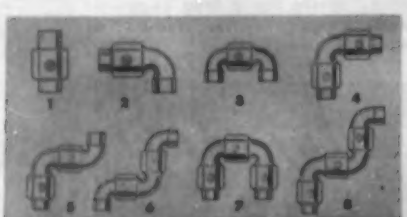
An Emsco Swivel Fitting is practically unexpendable for the reason that, after long service, both the packing and the ball races are easily adjustable and replaceable. This means no discarded fittings—no costly return to the factory for repairs.

Emsco "free turning" Ball Bearing Swivel Fittings are manufactured for almost every type of service, from high vacuum to pressures of 15,000 psi., and from sub-zero temperatures to 750°F. Complete information, prices and delivery upon request.

Deformable packing extruded into annular grooves assures a positive seal. This Emsco patented method does not affect ease of turning. Any packing material such as asbestos, Blue African Asbestos or Teflon may be used in the US Type fitting.

Fittings using a lip type packing are available as Type HS or HP, depending on pressure involved

LIP TYPE PACKING



8 BASIC STYLES—OVER 500 MODELS

EMSCO
MANUFACTURING COMPANY
BOX 2098, TERMINAL ANNEX
Houston, Texas • LOS ANGELES 54, CALIF. • Garland, Texas

Free Literature Offered in this Month's Ads

Continued

How you can have DRY AIR with exact moisture control is described in Bulletins 112 and 122 offered by Niagara Blower Company.

Circle 89 on Reader Service Card

How Dryseal-thread PRESSURE PLUGS work is described in literature available from Standard Pressed Steel Co.

Circle 115 on Reader Service Card

PRESSES and AIR CYLINDERS are presented in a catalog by Air-Mite, which covers their line. Your special needs for presses are invited.

Circle 4 on Reader Service Card

Descriptive data sheets on AIR and HYDRAULIC CONTROL VALVES are obtainable from C. B. Hunt & Son, Inc.

Circle 63 on Reader Service Card

An illustrated Browne & Sharpe Mfg. Co. catalog describing 185 STOCK PUMPS is available.

Circle 22 on Reader Service Card

Precision made AIR CYLINDERS from 2 to 12 in bore are covered in catalog No. 102, released by The S-P Mfg. Corp. Also catalog No. 103 is available on HYDRAULIC CYLINDERS.

Circle 107 on Reader Service Card

Automatic Valve Co. is offering a bulletin on AIR CONTROL VALVES. 3-way and 4-way pilot operated and solenoid operated pilot valves are covered, A speed control valve with pressures up to 1200 psi is also presented.

Circle 17 on Reader Service Card

Continued on page 58

Here's what you get in HOUGHTON VIX-SYN Packings

LONG SERVICE LIFE—Houghton's VIX-SYN synthetic rubber packings are compounded to eliminate swelling or shrinkage under use with all common types of hydraulic oils and fluids. Their unique molding process assures a compact, close-grained structure.

SMOOTH, PERFECT SEALING SURFACE—VIX-SYN packings are molded in polished molds. This assures a mirror-smooth surface that reduces wear and friction in moving seals.

FAST, DEPENDABLE DELIVERY—Adequate stocks of all popular sizes of VIX-SYN "O" rings, "V" Packings and "U" Cups are maintained. And these stocks are backed up by large, modern production facilities that insure delivery of *your* packings to meet *your* production schedules.

Give your hydraulic or pneumatic equipment the advantages of Houghton VIX-SYN Packings. We'll be glad to quote on your requirements on *your* delivery schedule. Write E. F. Houghton & Co., 303 W. Lehigh Ave., Phila. 33, Pa.

VIX-SYN PACKINGS
. . . products of

E F HOUGHTON & CO.
PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

Ready to give you on-the-job service . . .

SKINNER EXPLOSION-PROOF

stainless steel solenoid valves

Underwriters' Approved For Class 1, Group D, Hazardous Locations

X5 SERIES

Extremely flexible design makes the small Skinner X5 Series the *most versatile explosion-proof valve on the market!*

X5 Series Valves are inexpensive, yet built to highest quality standards. Rugged, stainless steel construction, simplicity of design (only one moving part) and spring-loaded plungers with positive-sealing synthetic inserts contribute to trouble-free operation — through *millions of cycles.*

Skinner X5 Series Valves can be easily disassembled and inspected without removal from the line.

X5 Series Valves are available in a broad selection of types, voltages, pressures, flow control adjustments, port sizes and port locations.

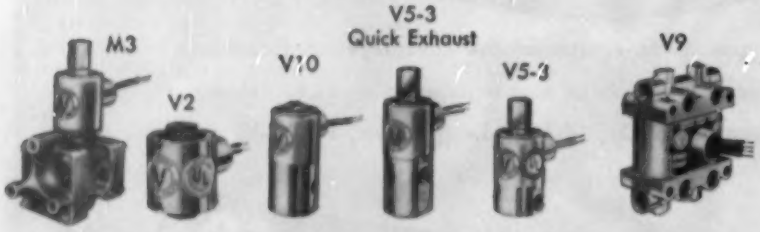
TYPE X5 SPECIFICATIONS

Type	Two-Way and Three-Way, Normally Open, Normally Closed, and Directional Control
Pressure Range	0-1000 p.s.i.
Orifice Diameter	3/64" to 1/4"
Pipe Size	1/8" or 1/4" NPT
Voltage	All AC and DC
Power Consumption	10 Watts Max.
Duty Cycle	Continuous or Intermittent

Write for BULLETIN 526A

TYPICAL SKINNER VALVES

Write for information about our complete line.



SKINNER SOLENOID VALVES

THE SKINNER CHUCK COMPANY
105 EDGEWOOD AVENUE, NEW BRITAIN, CONNECTICUT

Circle 110 on Reader Service Card

Free Literature Offered in this Month's Ads

Continued

Illustrated brochure A is available from Waterman Engineering Co. on FLOW REGULATORS. Phases and applications of automatic flow regulation are discussed.

Circle 134 on Reader Service Card

Cuno Engineering Corp. is offering a bulletin on their AUTOKLEAN STRAINERS. These filters for cleaning oil hydraulic systems are built to operate at pressures up to 3000 psi.

Circle 32 on Reader Service Card

Literature can be obtained from M-B Products on their automatic AIR LINE FILTER, REGULATOR and LUBRICATOR assembly.

Circle 81 on Reader Service Card

A complete catalog on VALVES for industrial, chemical and aircraft use is offered by Republic Manufacturing Co. Low and high pressure check valves of brass, aluminum alloy, steel and stainless steel are described.

Circle 103 on Reader Service Card

A new SERIES TYPE VALVE, manufactured by Sundstrand Machine Tool Co., eliminates load drop, assures positive control. Adjustable for pressure relief between 500 and 1500 psi. Available in 1/2 and 3/4 in sizes. Bulletin No. 3103-1 gives further information.

Circle 118 on Reader Service Card

The Tomkins-Johnson Co. is offering bulletin 454 which covers their new Spacemaker AIR CYLINDERS. Many standard sizes and styles for pushing, pulling, lifting, clamping or for control, are covered.

Circle 121 on Reader Service Card

OIL FILTER catalogs covering industrial, aviation, automotive and fleet use can be obtained from Purolator Products, Inc.

Circle 100 on Reader Service Card

Continued on page 61

CYLINDERS!

CYLINDERS!

heavy duty

CYLINDERS.. Air or Hydraulic

CYLINDERS!

More of them..and faster!

Why? Because we're in our new factory . . devoted exclusively to the manufacture of Lindberg air and hydraulic cylinders . . standard, special, and mill type.

Our capacity has been quadrupled . . our service streamlined. *Rush deliveries when necessary.*

Design engineers for original production equipment manufacturers, have specified Lindberg Cylinders on applications such as lathes, drill presses, industrial furnaces, straightening presses, plastic extrusion presses, die casting machines, marking machines, and shears, as well as a wide variety of construction machinery.

Ask for Bulletin 1500 covering the complete line of standard and special Lindberg Cylinders . . air and hydraulic.

Visit Lindberg exhibit at Tool Engineers Industrial Exposition, Philadelphia Convention Hall, April 28-30th

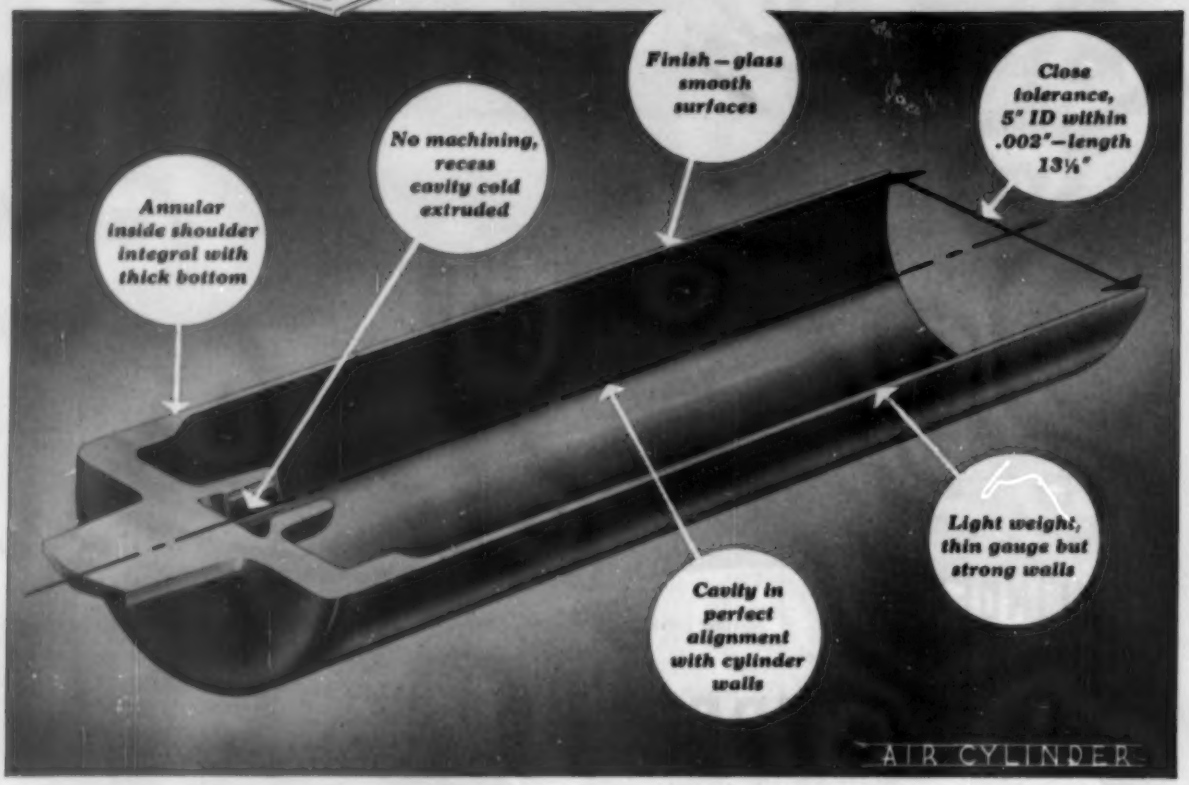
LINDBERG AIR..HYDRAULIC CYLINDERS

Lindberg Air and Hydraulic Division

Lindberg Engineering Company, 7216 North Loftin Street, Chicago 7, Illinois

Circle 76 on Reader Service Card

Now Mullins Koldflo makes your dream design practical


Finish—glass smooth surfaces
Close tolerance, 5" ID within .002"—length 13¼"
No machining, recess cavity cold extruded
Annular inside shoulder integral with thick bottom
Light weight, thin gauge but strong walls
Cavity in perfect alignment with cylinder walls
AIR CYLINDER

Mullins *Koldflo* makes this finished part in one piece... *without machining*

- **You can now design intricate parts the way you want them—without compromise**
- **You can add important new sales features**
- **And Mullins Koldflo design cuts your costs**

ALL you have to do to put your dream ideas *into production* is to call the nearest Mullins office. An experienced Mullins *Koldflo* sales engineer will help you design parts that can be mass produced and *finished in one piece*—by the revolutionary Mullins *Koldflo** process!

*Trade-Mark

Koldflo
DIVISION
MULLINS MANUFACTURING CORPORATION
Salem, Ohio

Phone—Salem 6771

DISTRICT SALES AND ENGINEERING OFFICES

New York
500 Fifth Avenue
Phone—Pennsylvania 6-2773

Detroit
18268 James Couzens Highway
Phone—Diamond 1-1490

Chicago
332 South Michigan Avenue
Phone—Harrison 7-3725

Free Literature Offered in this Month's Ads

Continued

IDEAS BOOKLET is available from Gast Manufacturing Corp. A catalog may also be obtained on their products. Problems encountered in regard to application, installation or performance can be submitted for solution.

Circle 50 on Reader Service Card

STEEL HYDRAULIC COUPLINGS are presented in catalog #53 by L & L Manufacturing Co. Some of the new subjects covered are needle valves, ball check valves, swivel elbows and pipe nipples.

Circle 72 on Reader Service Card

Your copy of the Dyna-seal Engineering Data booklet offered by Precision Rubber Products Corp., is now available. How PLUG SEALING PROBLEMS may be solved is explained.

Circle 99 on Reader Service Card

Full details may be obtained from Gresen Manufacturing Co. on their MULTI-CONTROL VALVE. Many of the features are described.

Circle 54 on Reader Service Card

A FLAME-RESISTANT HYDRAULIC FLUID is described in detail in a bulletin available from Celanese Corporation of America.

Circle 27 on Reader Service Card

Bulletin OB-1152, released by United States Gasket Co., describes their "PACKING PACKAGE" of back-up rings and "O" rings.

Circle 126 on Reader Service Card

Any rpm by dial control is explained in a 16 page booklet offered by U S. Electrical Motors Inc. Easy selection of speed is obtained with "VARIDRIVE" MOTORS.

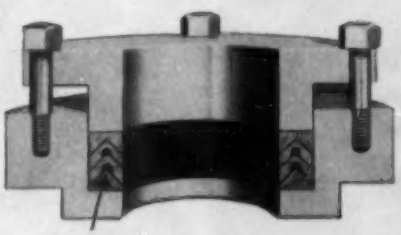
Circle 125 on Reader Service Card

Why users prefer

CHEVRON* Packing

for rams, plungers, reciprocating rods

1. *Assures a low friction, positive seal*
2. *Lasts much longer, needs less maintenance than ordinary V-type packing*
3. *Works efficiently in a shallow stuffing box*



Note the exclusive hinge-like construction of CHEVRON packing.

Garlock 431 CHEVRON Packing

GARLOCK CHEVRON Packing is entirely different from ordinary V-type packings. With *increasing* pressures CHEVRON rings tighten and prevent leakage; with *decreasing* pressures the packing eases off and permits operation with a minimum of friction.

Service reports, such as those below, prove that CHEVRON packing seals better and lasts longer.

▶ On hydraulic press—40" ram, 6,000 p.s.i., ram honed and chrome plated, gland machined to give clearance of .006" between gland and ram. Garlock 431 CHEVRON size 40" x 41½" x only 2" deep gave 14 years service.

▶ On a machine with hydraulically operated clutches—¾" cylinder, maximum pressure 500 p.s.i., service intermittent, maximum travel ¾". First used cups, then "O" rings, neither of which worked well. Now packed with Garlock 431 CHEVRON ¾" x ¾" x 1⅛" deep and doing a smooth, positive sealing job.

Ask your Garlock representative to give you all the cost-saving facts about CHEVRON packing, or write for folder AD-115.

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK

Sales Offices and Warehouses: Baltimore • Birmingham • Boston • Buffalo • Chicago • Cincinnati • Cleveland Denver • Detroit • Houston • Los Angeles • New Orleans • New York City • Palmyra (N.Y.) • Philadelphia Pittsburgh • Portland (Ore.) • Salt Lake City • San Francisco • St. Louis • Seattle • Spokane • Tulsa.

In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

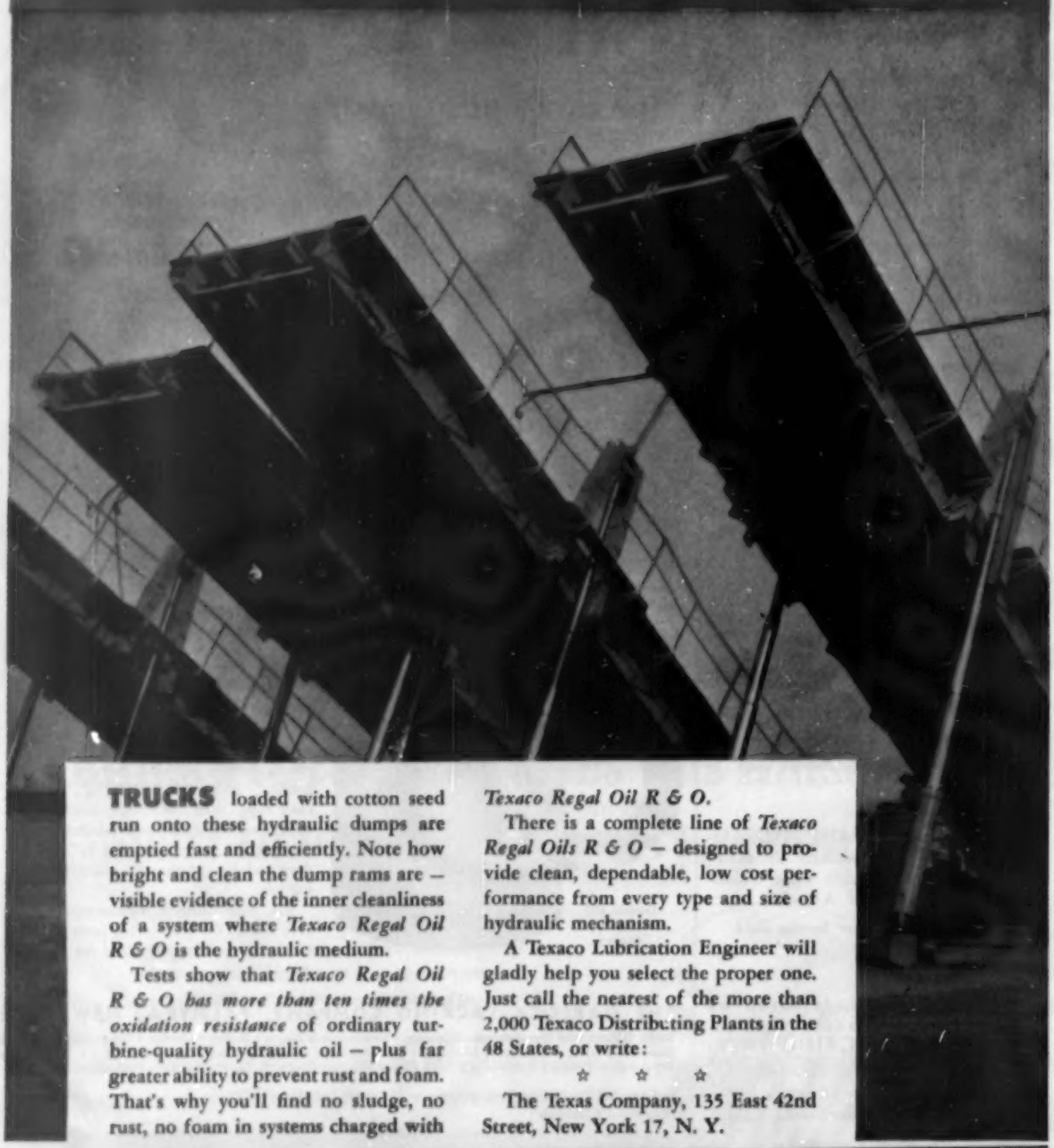
*Registered Trademark

GARLOCK

PACKINGS, GASKETS, OIL SEALS, MECHANICAL SEALS
RUBBER EXPANSION JOINTS

Circle 49 on Reader Service Card

CLEAN, RUST-FREE RAMS



TRUCKS loaded with cotton seed run onto these hydraulic dumps are emptied fast and efficiently. Note how bright and clean the dump rams are — visible evidence of the inner cleanliness of a system where *Texaco Regal Oil R & O* is the hydraulic medium.

Tests show that *Texaco Regal Oil R & O has more than ten times the oxidation resistance* of ordinary turbine-quality hydraulic oil — plus far greater ability to prevent rust and foam. That's why you'll find no sludge, no rust, no foam in systems charged with *Texaco Regal Oil R & O.*

There is a complete line of *Texaco Regal Oils R & O* — designed to provide clean, dependable, low cost performance from every type and size of hydraulic mechanism.

A Texaco Lubrication Engineer will gladly help you select the proper one. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

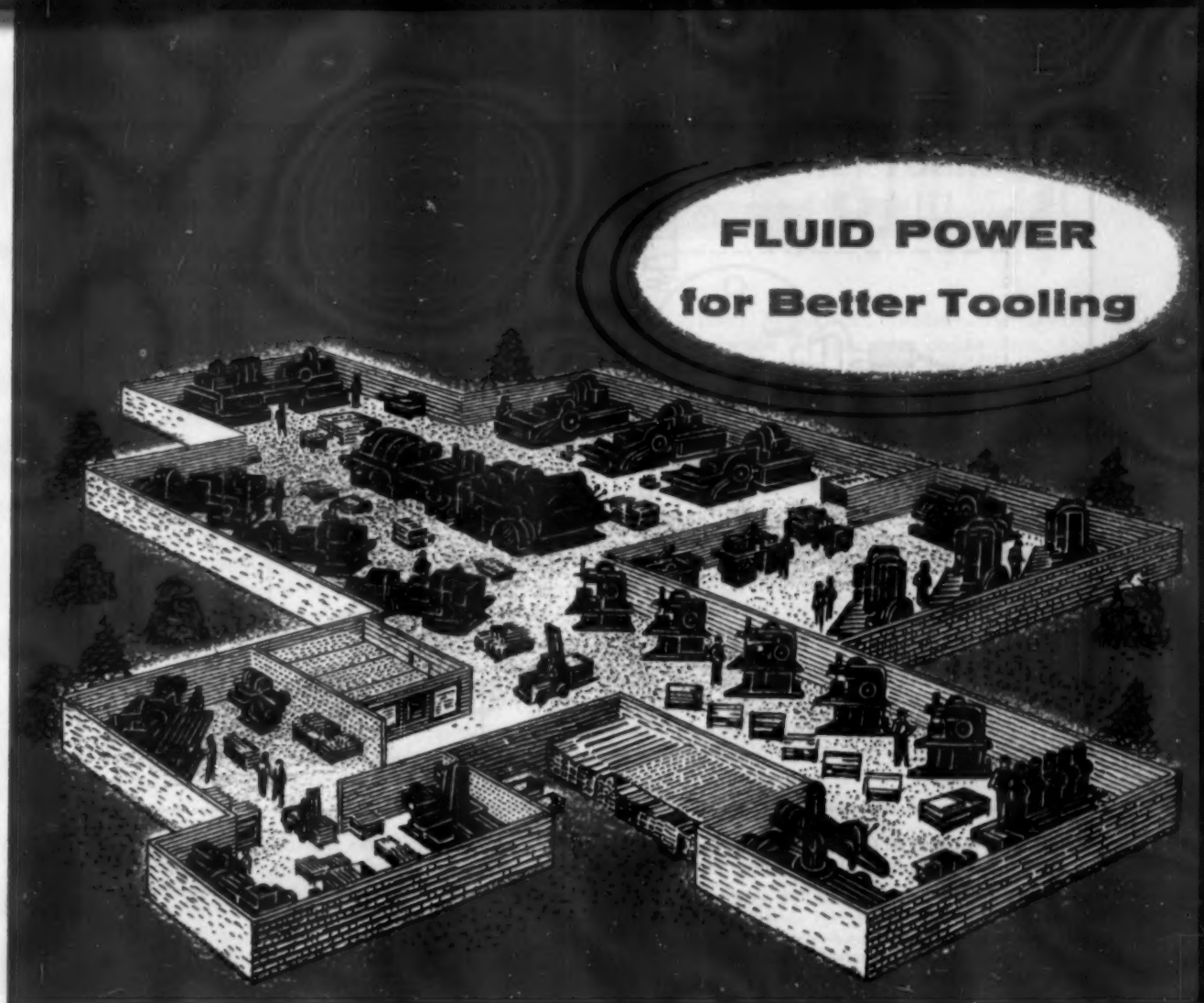
The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Regal Oils R&O

FOR ALL HYDRAULIC UNITS

TUNE IN . . . METROPOLITAN OPERA radio broadcasts every Saturday afternoon. See newspaper for time and station.



GREATER production, better product quality, lower equipment cost and greater operator efficiency result from the use of air and oil powered tooling. Whether it's on the assembly line, in the machine shop, press room, shipping room or the paint shop, tools using fluid power have helped to increase profits.

On the following pages, articles describe successful air and hydraulic circuits used on tooling in shops throughout the country. The articles emphasize design for safety, efficient movement of materials, and proper circuit layout for lower maintenance. Wide use of compressed air offers a power source for clamping, feeding and indexing operations on tools which operate at pressures under 100 psi. For heavy loads and accurate feed control, oil pressure is selected to power the tooling.

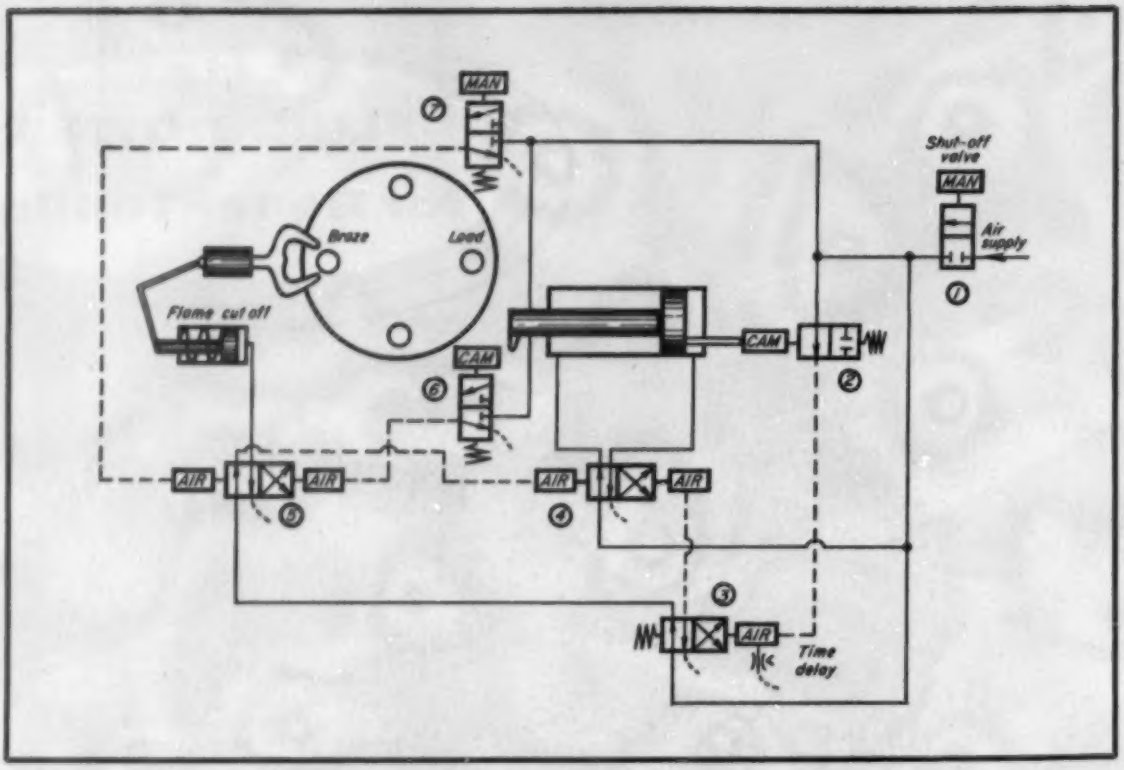


FIG. 1. PNEUMATIC CIRCUIT cuts out brazing flame and prevents indexing if the operator is not ready before the end of brazing time. If the operator is ready in time, the table will index and the flame will be maintained.

Air Actuated Brazing Setup Gives Cycle Control and Protection

By Andrew M. Damer

PRODUCTION tooling for a brazing operation in the Barrie, Ontario plant of Canadian General Electric has an air controlled circuit which indexes the work, and accurately controls brazing time.

Development of this special brazing equipment was carried out to meet production requirements for a part on a G. E. home appliance. Simplicity, accuracy and safety have been obtained with the tooling which was built for G. E. by Hard Metal Fabricators Ltd. of Toronto. Figure 1 shows the air control circuit; figures 2 and 3 show the completed machine and tooling.

Four work fixtures are mounted on top of an air indexed, rotary table. The operator loads the parts in the station opposite the brazing station. This arrangement keeps the operator safely away from the flame.

Quality of the brazed joint largely depends upon

ANDREW M. DAMER, John Spotton Co. Limited, Toronto, Canada

control of brazing time—time during which the flame is in contact with the work. Timing on this fixture is controlled by time delay valve 3 shown in Figure 1. This valve is a simple two position 4-way valve which is pilot operated to one position and spring returned when pilot pressure is removed. Brazing time is equal to the time it takes for trapped pilot pressure to exhaust to atmosphere permitting spring reversal of valve 3. This time interval can be adjusted by varying the exhaust orifice.

The air circuit is arranged so that the table will index 90 degrees only after the operator has completed the loading, depressed 7, and the brazing time has expired. Normally the operator completes the loading before the time delay valve shifts. In this case, after loading, he depresses valve 7 and when the time delay valve shifts, the table indexes to locate another part in the brazing station.

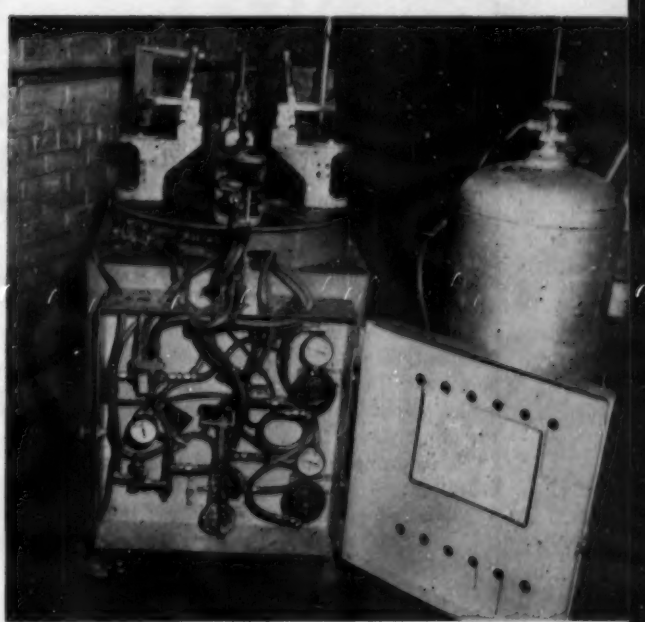
If the operator does not complete the loading during the brazing time or for some reason has left the machine unattended, the circuit is arranged so that the flame cuts out and the table does not index.

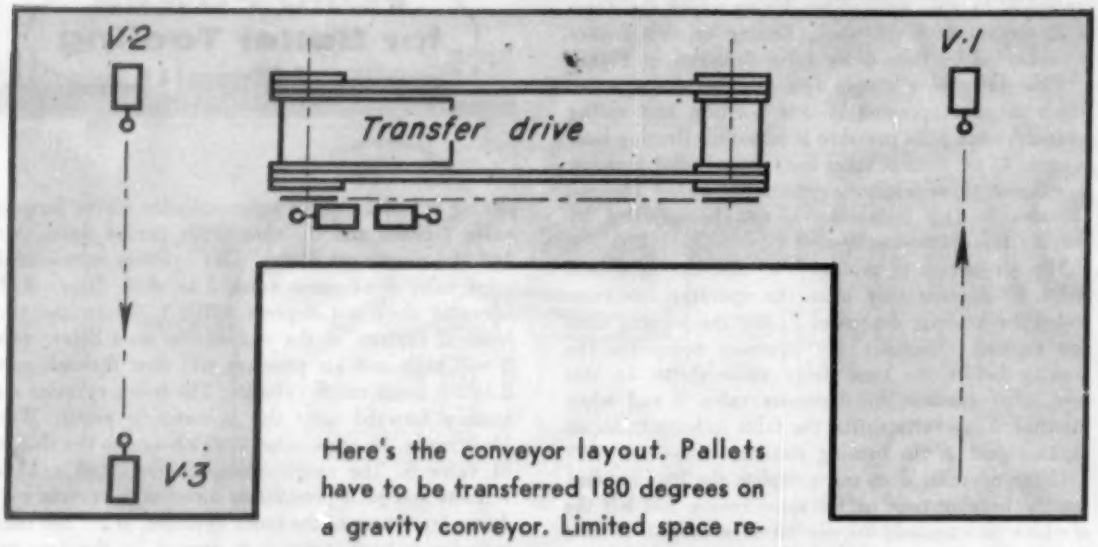
Here's how the circuit works. To start the machine, shut-off valve 1 is opened. Air flows through valve 2 and pilot pressure is applied to time delay valve 3 to shift this valve. Reversal of the time delay valve directs pilot pressure to reverse control valve 4. Air pressure is now applied to the head end of the indexing cylinder. As the index cylinder moves forward, valve 2 closes and the time delay period starts. Also forward movement of the index cylinder momentarily trips valve 6 to cause valve 5 to shift. Now, if the operator does not depress valve 7 before the time interval expires, at the end of the time delay, valve 3 will shift and air pressure will flow through valve 5 to the flame cutoff cylinder. The index cylinder will remain forward until the operator is ready. When he is ready, he trips valve 7 which causes the shifting of valve 5. The single acting flame cutoff cylinder retracts and pilot pressure is directed to reverse valve 4 causing return of the index cylinder. When the index cylinder is back, valve 2 is opened by the cam and the cycle repeats.

Had the operator been ready before the time delay expired, depressing valve 7 would have shifted valve 5 so that when valve 3 reversed, air pressure would be directed to pilot operate valve 4 instead of operating the flame cutoff.

FIG. 3 THE LOADING FIXTURES have been removed to show the index table and the indexing air cylinder. Cam operated valve 2 (see Figure 1) is seen mounted on the blank end of the cylinder. The hand trip of valve 7 is visible on the loading side of the machine.

FIG. 2. COMPLETED BRAZING SETUP. Controls for the air circuit and brazing torch are mounted so that pressure and timing adjustments can be easily made. This self contained production unit, which requires only air connections, can be conveniently placed in the production line.





Here's the conveyor layout. Pallets have to be transferred 180 degrees on a gravity conveyor. Limited space requires sharp turns. To solve this problem an . . .

AIR CIRCUIT Controls Transfer Device

By George R. McKee

IN laying out gravity type conveyors, especially of the pallet handling type, there are times when space limitations do not permit using curves of large enough radii to prevent skewing of the pallet as it travels around the curve.

We recently completed a conveyor installation where the space limitations were such that curves were abandoned in the design stage and in their place an automatic pneumatic 180 degree transfer was used. This in itself was unique because the loads varied approximately 200 pounds and impact at the low end sufficient to severely bump the pallet could not be permitted. In addition, the mechanism had to be explosion-proof due to explosive lacquer fumes surrounding it.

The transfer mechanism had to meet the following conditions:

1. Make two complete 90 degree transfers without shifting pallet "out of square" with conveyor center line.
2. Control travel so there could be no excessive impact at the low end of cross transfer even though the weight variation may be well over 2 to 1. This condition alone has made the use of gravity impossible in many layouts.
3. Must have no features that would prevent its use in lacquer fumes.
4. Must be capable of operating in a drying oven where the temperature averages 135 degrees F.

The transfer mechanism with pneumatic controls, met all of these conditions and has had all bugs eliminated through extensive field tests.

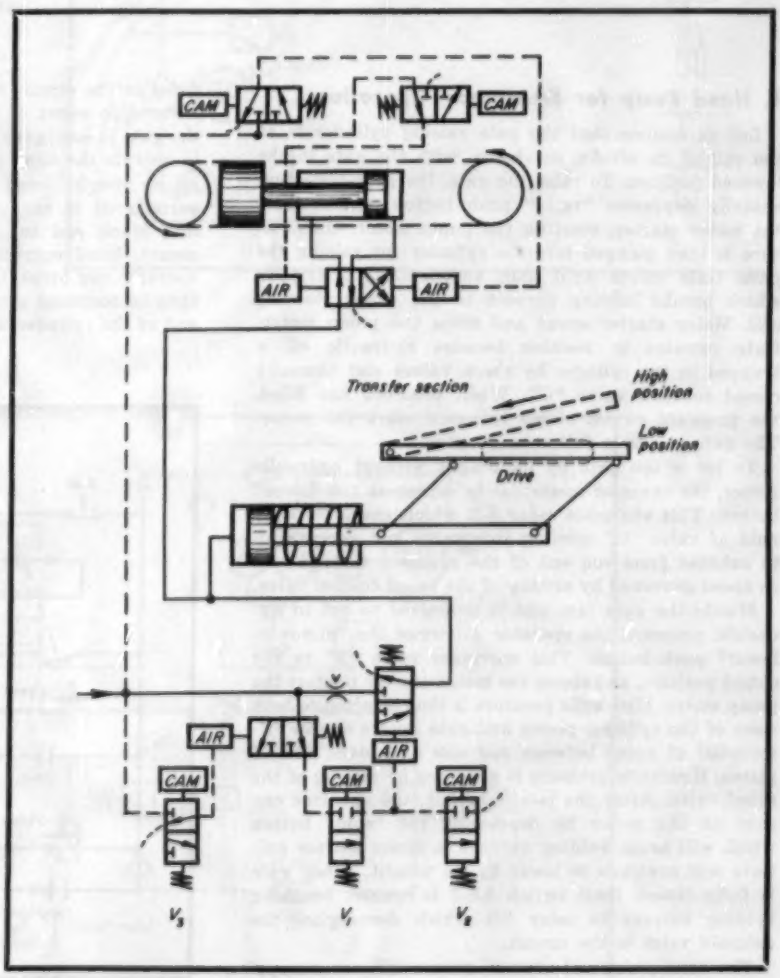
Movement is accurately and safely accomplished with the simple air circuit shown here. The air circuit powers a cylinder which raises the pallet from the receiving leg of the transfer section as it enters the first 90 degree turn and lowers it onto the discharge leg at the second turn. As the pallet is lifted at the first turn, pressure is applied to the pneumatic transfer drive cylinder also. Pressure for the transfer drive is removed from the cylinder when the pallet reaches the second turn. Cam operated ¼ inch pilot valves

GEORGE R. McKEE, Logan Company, Louisville, Kentucky

are actuated by the movement of the pallet. Movement of the pilot valves causes movement of the 3/8 inch master 3-way valves. The cam operated valves in the pneumatic transfer are operated by the transfer drive cylinder at the end of each stroke. These cam valves operate a 1/4 inch master 4-way valve.

When the pallet rolls into the first turn, pilot valve V-1 is opened to direct pilot pressure to the 3/8 inch master valve. Air pressure is then directed to the single acting cylinder to raise the pallet. At the same time air pressure is applied to the transfer drive cylinder. The drive cylinder starts its reciprocating movement which moves a cross head slide forward and backward on the upper and lower strands of a chain wrapped around end sprockets which drive the V-belts upon which the pallet rests when the cross transfer section is lifted by the single acting cylinder. The cross head has sprockets which alternately lock and release on the upper and lower strands of the chain, V-belts and pallet. When the pallet rolls into the second turn and contacts pilot valve V-2, the pilot pressure is exhausted. This opens the 3/8 inch master valve, allowing the single acting cylinder to be retracted. This in turn allows the transfer section and attached drive to return to the low position, resulting in the pallet being deposited onto the discharge leg. As the pallet rolls off the discharge leg it passes over V-3. If the pallet is not removed from V-3 the master valve operated by V-3 closes and causes V-1 to be ineffective, making it impossible to move another pallet around the transfer which could cause a jam until the first pallet clears.

The speed of the lifting action is throttled by the speed control valve on the supply line port of the main valve. The original speed control valve on the discharge port had to be discarded because it offered too much resistance to the lowering of the section which was a combination of spring and gravity forces not sufficient to warrant a speed control valve.



CIRCUIT SCHEMATIC shows the transfer raising mechanism and the transfer drive. Automatic actuation for transfer is caused by the work pallet striking cam operated air valves. Reciprocation of the transfer drive is maintained, when the section is in the raised position, by the actuation of cam valves at each end of the transfer cylinder stroke.

Is Your Hydraulic Tooling Safe?

By H. L. Stewart
Logansport Machine Co., Inc.

EMPHASIS on mass production has required the development of large multiple operation machines. In designing these machines, designers have found that hydraulic components have provided a satisfactory solution to many of their complex problems. One problem that has been solved to a high degree of success is safety,—safety to the machine, to the operator, and to the workpiece.

The question often arises as to how far one should go in designing safety into a piece of equipment. The operator must be protected as far as possible even though he may try to establish some short cut to increase production which could greatly endanger himself. Designers spend many hours trying to outsmart the operator, then still may come out second best.

From a safety engineer's standpoint, one can never design too much safety into a machine, but there is one thing that must also be remembered—the machine must be designed for a price. The safety devices must be as simple as possible and still afford ample protection.

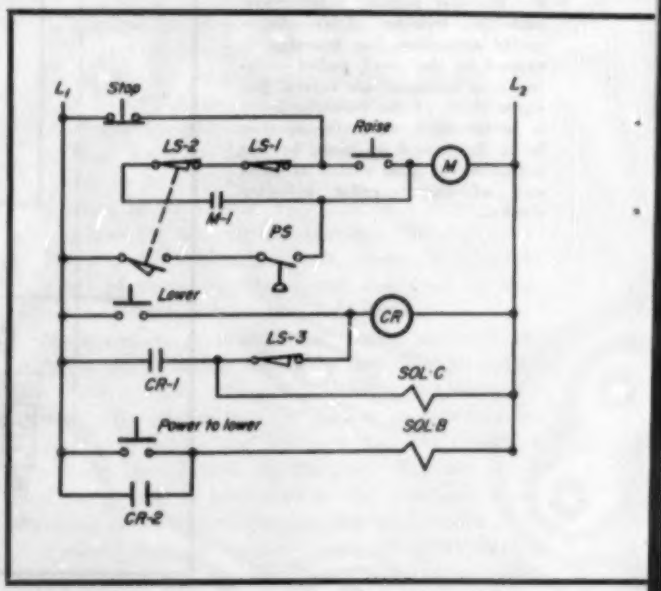
1. Hand Pump for Emergency Operation

Let us assume that the gate raising cylinder is at the end of its stroke, as shown, with the gate in the lowered position. To raise the gate, the operator momentarily depresses "raise" push button which closes the motor starter, starting the pump motor. Oil pressure is then pumped into the cylinder for raising the gate. Gate raises until limit switch LS-2 is tripped which breaks holding current to the motor starting coil. Motor starter opens and stops the pump motor. Gate remains in position because hydraulic oil is trapped in the cylinder by check valves and normally closed solenoid valve "C". When penstock has filled, the pressure switch closes to again start the motor. The gate raises to full open position.

To lower the gate by its weight without hydraulic power, the operator momentarily depresses the 'lower" button. This energizes relay CR which energizes solenoid of valve "C" opening this valve and permits oil to exhaust from rod end of the cylinder. Gate lowers as speed governed by setting of the speed control valve.

Should the gate jam and it is desired to cut in hydraulic pressure, the operator depresses the "power to lower" push button. This energizes valve "B" to the closed position, and closes the motor starter to start the pump motor. Hydraulic pressure is then directed to both sides of the cylinder piston and gate lowers due to differential of areas between rod side and blank end of piston. Hydraulic pressure is governed by setting of the relief valve. After the jam is broken, the operator can shut off the motor by depressing the "stop" button which will break holding current to motor starter coil. Gate will continue to lower by its weight. When gate is fully closed, limit switch LS-3 is opened, breaking holding current to relay CR which deenergizes the solenoid vales in the circuit.

The hand pump and shut off valves "E" are incorporated in the circuit so that the gate may be raised or lowered in event of electrical power failure. To raise the gate in emergency, it is only necessary for operator to operate the hand pump. However, to lower the gate by its weight, hand valve E-2 must be opened. This permits oil to exhaust from rod end side of cylinder into blank end so that the gate can lower. If jam occurs, hand operated valve E-1 is then closed and operator can break jam by hand pump. Valve E-1 can then be reopened after jam is broken so that the blank end of the cylinder will fill with oil.

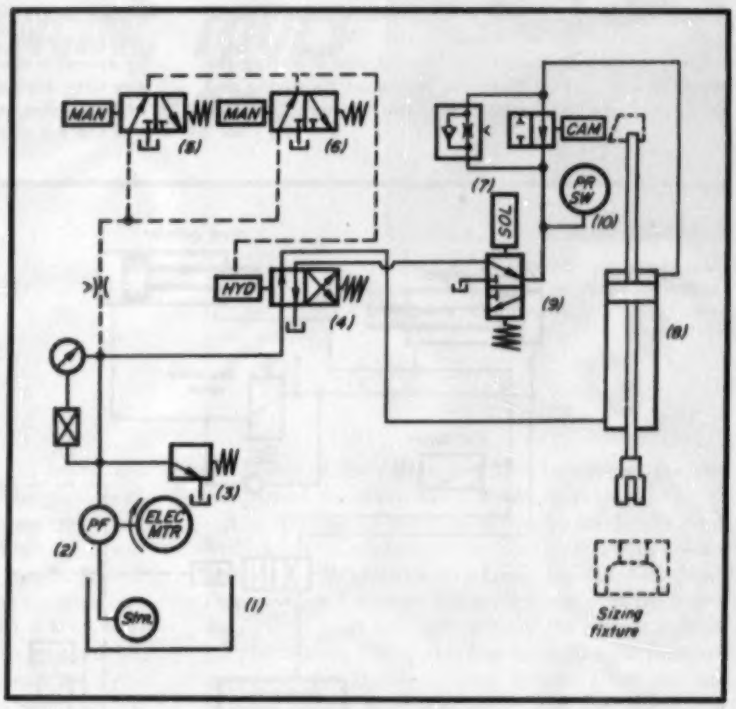


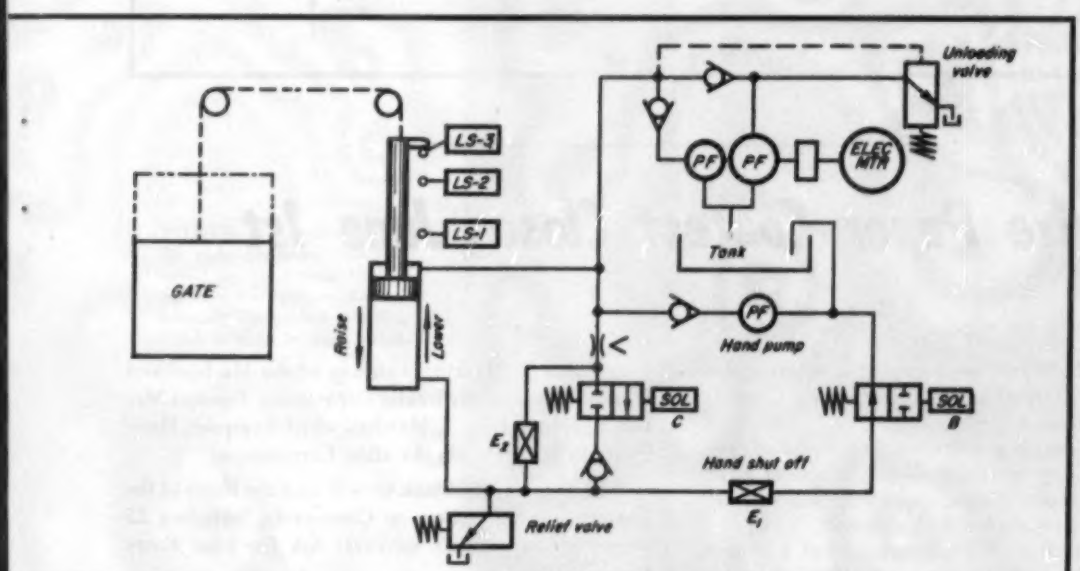
2. Two Manually Operated Valves and Pressure Control

The operator places the workpiece into the sizing fixture and shifts handles of both four-way, two position, spring return valves, 5 and 6, keeping both hands occupied. Oil flows to pilot connection on four-way, spring returned valve 4, shifting the valve spool, whereupon oil flows to the top port of coining cylinder 8 through ball check of cam operated speed control valve 7.

Piston of coining cylinder 8 advances, performing the work operation. The operator now releases his hands from handles of valves 5 and 6. These valves spring return to original position, releasing pilot pressure from valve 4. This valve returns to original position and oil pressure flows to bottom port of sizing cylinder 8, retracting the piston at rapid rate until cam on end of piston rod contacts cam roller of cam operated speed control valve 7. Oil flow is then metered through orifice, reducing speed of piston for remainder of stroke.

With this circuit, if the operator removes either hand from the valve handles, piston of coining cylinder will retract to original position. By using a pressure switch at the top end of the cylinder, a pressure overload will cause valve 9 to be energized. This will stop ram travel.





Safe Hydraulic Circuits

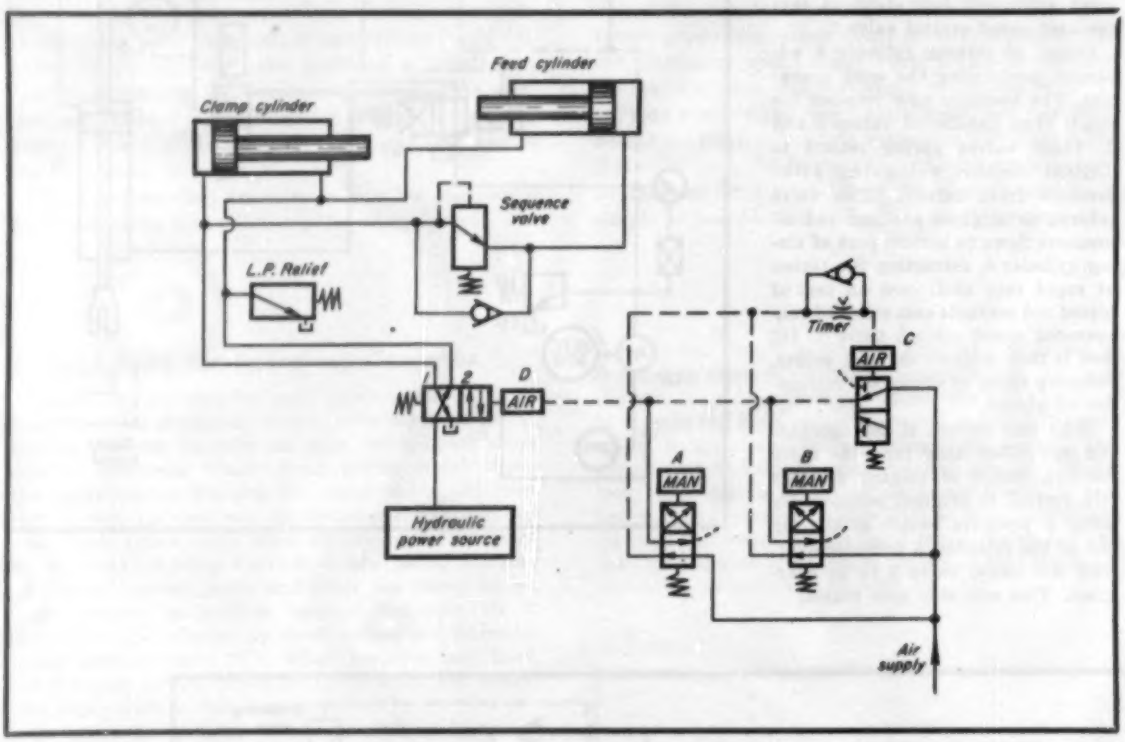
3. Safety Control and Overload Protection

During standby period, valves A and B are released to reset valve C. Valve D is in normal position with oil flowing out port 2 at low relief pressure back to tank. Both cylinders are retracted.

The operator depresses and holds A and B during the cycle. This action shifts valves D against its spring and valve C starts time delay. Oil flows through line 1 to the clamp cylinder. When built up pressure open the sequence valve, the feed cylinder advances.

Both cylinders hold at advanced position until valve C bleeds off for timed cycle. After the time interval, pilot pressure is removed from valve D allowing the spring in valve D to reverse oil flow. Both cylinders retract to normal position.

For the sake of safety, both A and B must be depressed and held during the cycle. Both must be released to charge valve C for the next cycle. This feature prevents "tying down" or otherwise tampering by operator of either button. Release of either button at any time during the cycle will cause immediate reversal of both cylinders.



Prize Paper Contest Closes June 1st

IF you have planned or are considering entering the APPLIED HYDRAULICS Prize Paper Contest, now is the time to do it.

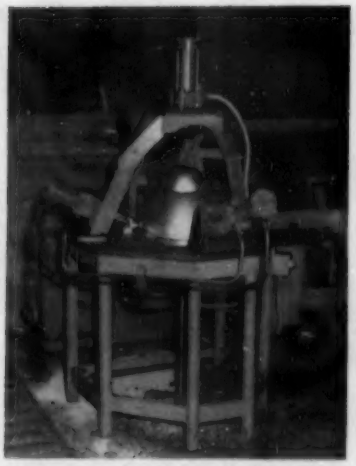
There is still time for you to enter. From titles of proposed papers on returned Entry Blanks, it is clear there will be some first rate design, application and maintenance entries to compete for the big prizes.

Every entry will be carefully considered by three judges, D. F. Green, chief engineer, Williams-White & Co.; Frank L. Mackin, chairman of the Machine and Wood Shops and Hydraulic Department, General Motors Institute; John T. Marshall, chief Engineer, Hamilton Division, Bendix Aviation Corporation.

With every Entry Blank we will send the Rules of the Contest and Suggestions to Contestants, including 25 suggested, appropriate subjects. Ask for your Entry Blank NOW!

FLUID POWER for Better Tooling

HYDRAULIC PIERCING TOOLS Increase Production 400%

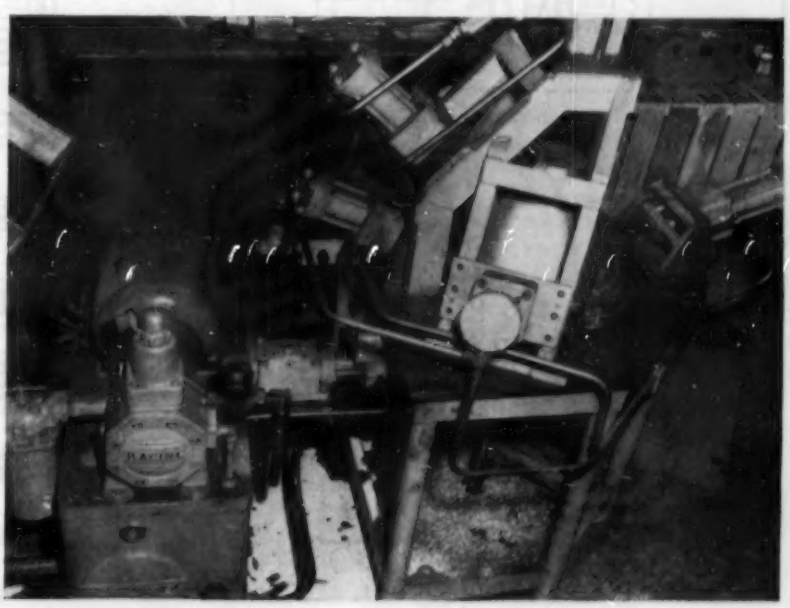


SINGLE PURPOSE piercing machine has six oil powered cylinders moving 15 punches.

SELECTION of tooling for piercing 15 holes in a large flood light housing presented the plant engineers at Westinghouse Electric Co. with several possibilities. When the job was first set up, piercing was done on a horn press. This required handling each housing six times, because the 15 holes are arranged in six groups. When production reached a level warranting tooling which would pierce the part in one hit, it was decided to build a special pierce machine.

The arrangement of the pierced holes made the use of a standard punch press and die impractical from the standpoint of die design and also because of the size and cost of the press which would be required.

A self contained machine having hydraulically powered pierce tools was built by Westinghouse in collaboration with Precision Products, Inc. of Cleveland. This machine has increased production over the previous method by at least 400 percent. Six cylinders drive the pierce tools. Oil is supplied by a 20 gpm pressure compensated, variable volume pump. Since no one cylinder pierces more than three .136 diameter holes, the piercing force developed by each 2½ inch cylinder



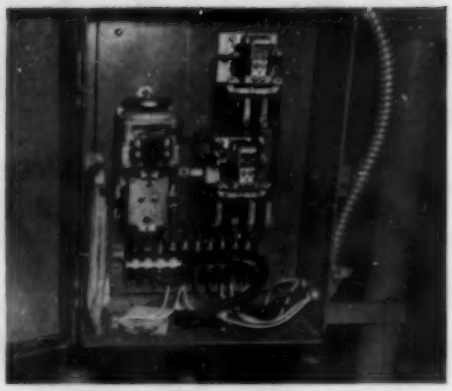
POWER is supplied by a 20 gpm pressure compensated pump driven by a 3 hp electric motor. An externally mounted suction filter is used in the circuit.

. . . an electric timer assures complete pierce through of the 15 punches before valve reversal

is under 2,000 pounds. Power consumption is very small. Peak pressure on the pump is well under 500 psi. Operating at this low pressure results in long life, minimum maintenance and very little leakage.

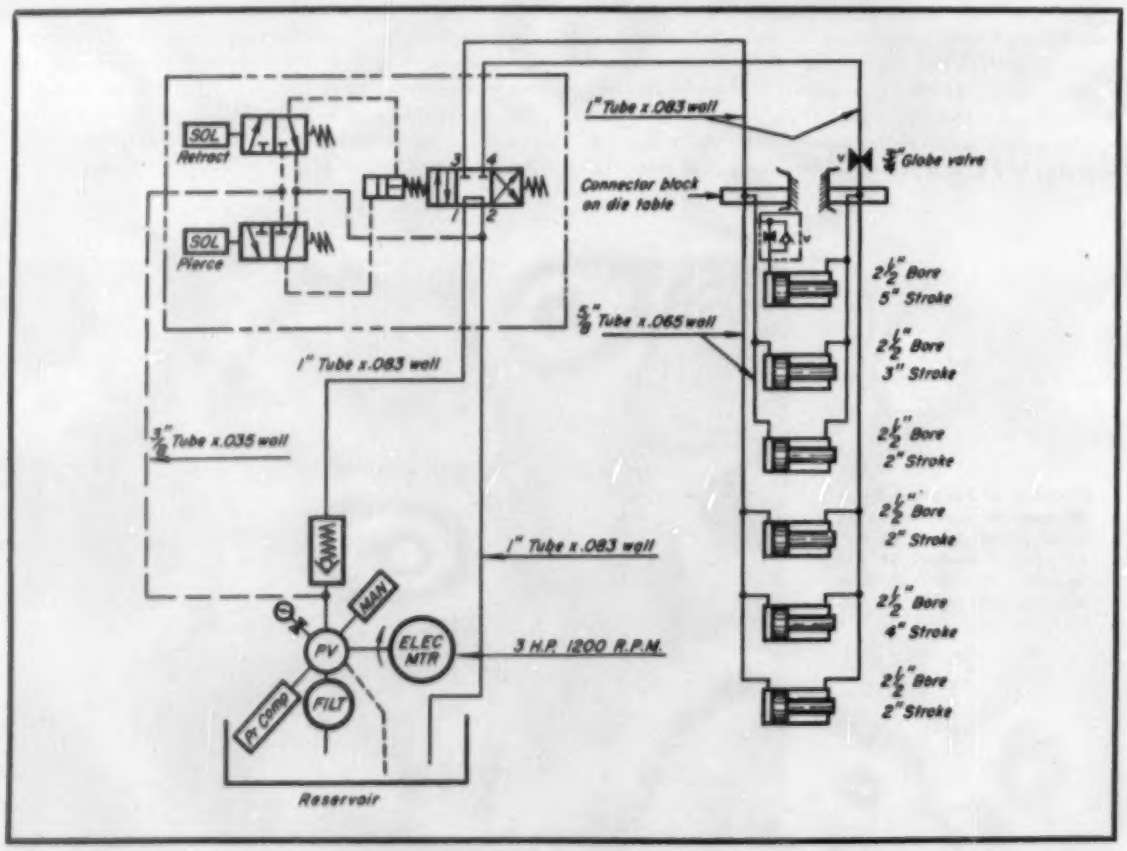
All cylinders move together on the forward piercing stroke. On the retraction stroke, motion of the top cylinder is retarded by a ¾ inch flow control valve. This arrangement assures retraction of all side punches from the work before release of the top cylinder which, acting against a rubber pad, exerts clamp pressure on the work.

The operating cycle is electrically controlled. The main control valve is a ¾ inch pilot operated, double solenoid, spring centered, three position, 4-way valve. With the pump running and the machine idle, pump delivery circulates back to tank through the neutral position of the control valve. Cylinder ports are blocked. After the housing has been located on the die, the operator presses a push button which energizes the pierce solenoid through a control relay and also energizes a timing relay. The cylinders move forward to pierce the work. When the timer times out, the pierce solenoid is deenergized and the retract solenoid is energized. The cylinders retract. Movement of the top cylinder, as it retracts completely, trips a limit switch to deenergize the retract solenoid. The control valve is then spring centered to neutral. The operator unloads and loads the machine ready for the next cycle.

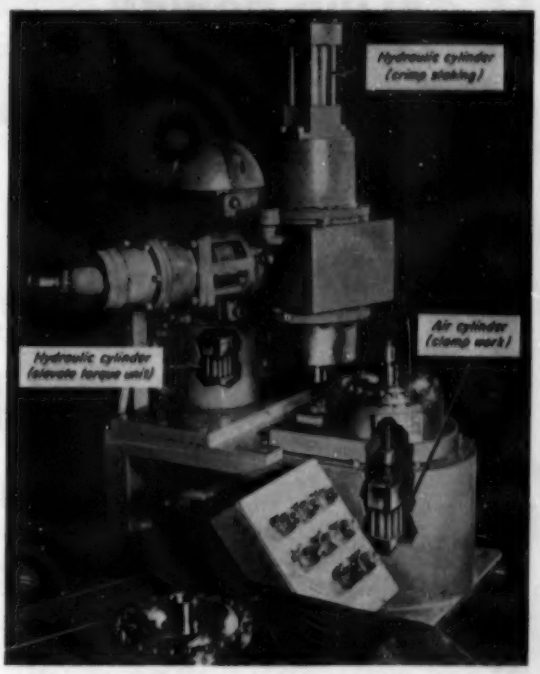


ELECTRICAL CONTROL PANEL contains two relays for hydraulic valve solenoid control and an adjustable timing relay which controls the time interval of the pierce phase of the cycle.

HYDRAULIC CIRCUIT for the 15 hole piercing machine.



High production assembly of bolted parts requires special tooling for speed and quality



23 Screws Are Tightened and Staked

. . . during an automatic cycle

A SPECIAL tool—a time and labor saving machine, designed and built by Hautau Engineering Co., of Detroit, Michigan, employs air and oil circuits for many of the operations to complete a cycle of automatic sequence. An air cylinder is used for a clamping operation and hydraulic cylinders for raising and lowering operations and for performing the actual crimp-staking. The specific function of the machine is to tighten the 23 fastening screws and to crimpstake the retaining cups of aircraft fluid couplings. Each operation of the sequence is entirely dependent upon the one preceding it. The machine was developed to meet the special needs of the aircraft industry.

How The Machine Works

The general operation of the machine is as follows: fluid coupling parts are placed in assembly position with crimp cups in place and the screws started one or two turns. The assembly is then clamped to the index table by the clamping collar of the clamp rod against the coupling assembly as the rod is driven down through the hub of the assembly by the air cylinder. A torque unit is automatically lowered by a hydraulic cylinder, until engagement with the fastening screws has been made. The screws are driven in by a screwdriver blade until the desired torque is attained. The torque spindle coaxially carries a rotating anvil. After proper torque has been reached, the crimping is accomplished by a hydraulic cylinder driving the anvil downward against a staking pin that crimps a portion of the retaining cup into the slot of the screw head. The anvil is then returned and the torque unit is raised by the hydraulic cylinder located in the central column. This action initiates the next index and the operation is repeated until 23 screws are properly torqued and crimped. One push of the start cycle button causes all the fastener screws to be torqued and crimped in continuous automatic sequence.

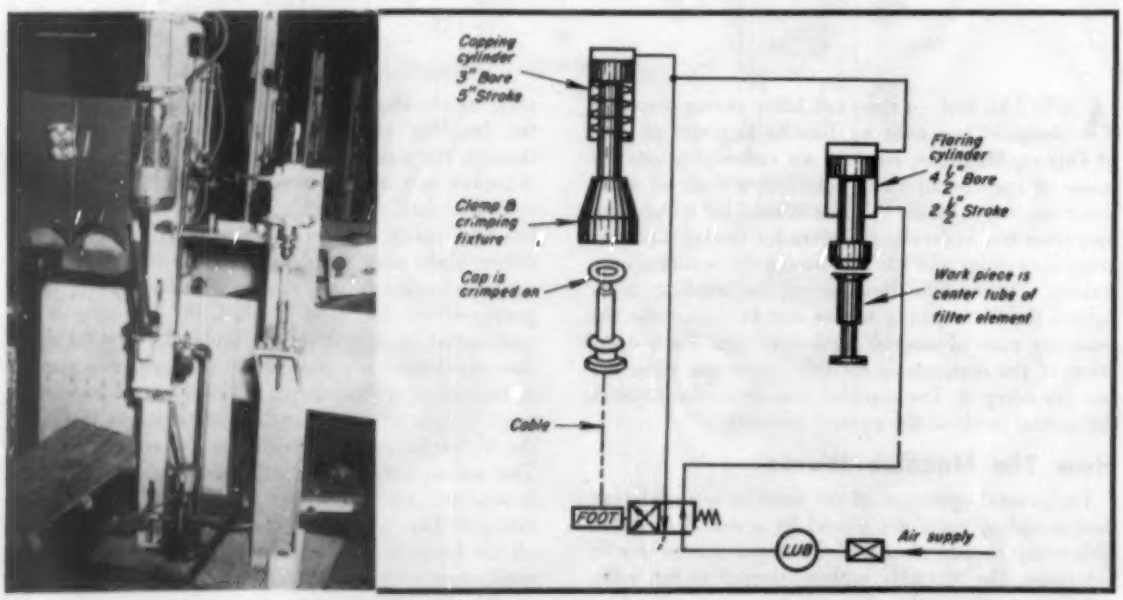
Can Shop-Built Air Presses Assemble Your Products?

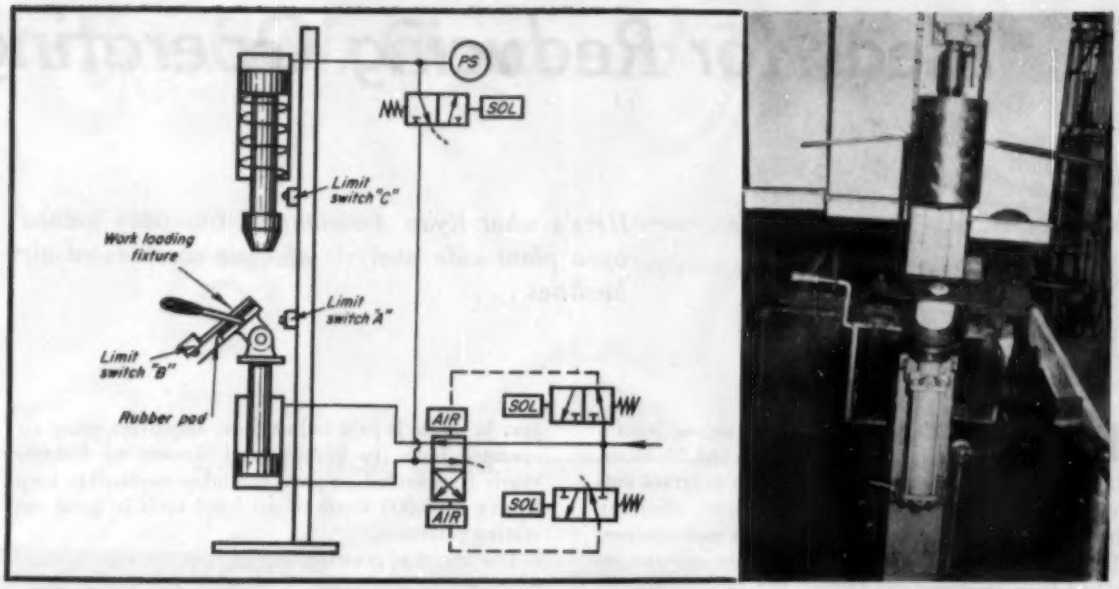
By Tom Jeffrey

We assemble lubricating oil filters with air power. At the Wix Accessories plant in Toronto, we have built our own air presses to flare and crimp metal parts and to pack the filter element. Although the assembly operations are simple, the great range in sizes and styles of automotive type filters require a variety of different press setups.

The accompanying photographs and drawings represent typical air powered devices in our assembly department. They are designed to perform an operation rapidly and correctly with a minimum of operator effort.

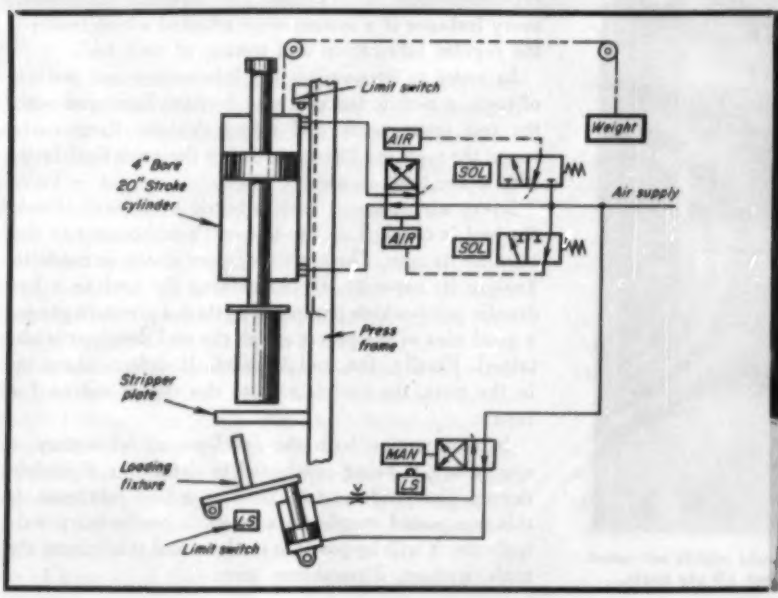
FOOT CONTROL of these two air presses makes this setup very simple. Both operations are performed together. A finished filter element is seen on the floor below the press. It consists of a waste-filled "sock" having an aluminum tube for a core. On these two presses, the end of the aluminum core is flared and then an end cap is placed over the core and crimped. A screen guard over the crimping tools protects the operator. When the crimping press is open, its loading fixture is tilted forward to make it easy to load and unload the tube and end cap. Pressing of the foot pedal actuates the air valve and also pulls the work piece in line with the crimping tool by action of the cable. A counter, actuated by the stroke of the crimp cylinder, keeps track of production. The 4-way, two position air valve is spring returned when the foot pedal is released.

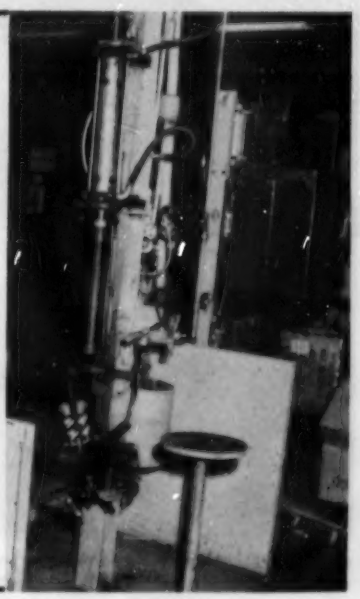




LIMIT SWITCHES control the operation of this press which finishes the capping of the "sock" filter element. When the handle on the loading fixture is pushed forward, limit switch "A" is tripped to shift the main valve which sends air into the blank end of the lower cylinder. The work table is raised to the height required by the filter element. When the element hits the crimping tool, pressure depresses the rubber pad, causing limit switch "B" to close. This action opens the solenoid valve which allows air into the top cylinder. Air pressure sends the air piston down to crimp the work piece. When pressure at the top of crimp cylinder reaches 100 psi, the pressure switch is actuated to deenergize the solenoid valve and cause the piston in the crimp cylinder to return. Limit switch "C" is tripped to return the main valve to its original position.

PACKING of the metal filter element is done on this air press. The cycle is controlled electrically. When the filter element, loosely filled with filter media, has been placed on the loading fixture, the hand valve is actuated to direct air to the load fixture cylinder. Movement of the valve handle also trips a safety limit switch. This switch prevents main ram operation before the load fixture is in the work position. A second limit switch, tripped by the load fixture, energizes one of the solenoid pilot valves to shift the main valve and send the press ram down. When pressure builds up on the packed material, the main cylinder, which is free to slide on the press frame, moves upward until it trips a limit switch. This limit switch causes reversal of the main valve to exhaust pressure from the top of the ram and apply pressure at the bottom to raise the ram.





Ideas for Reducing Operating

Here's what Ryan Aeronautical Company gained by a plant-wide analysis of their compressed air facilities . . .

BENEFITS of $20,000 a month can accrue from a new compressed air program launched by Ryan. Developed from an extensive survey, the program outlines the method for obtaining maximum efficiency from air operated tools, with minimum maintenance. Tests show that these substantial savings may be realized from increased production and reduced operating costs.

Because it is a silent, unseen source of power, compressed air is too often taken for granted. Yet it is a potent production force which deserves expert analysis. For instance, at Ryan, 680 horsepower is required to obtain the compressed air used by air powered tools.

Economically, the use of compressed air at Ryan involves substantial amounts. More than $2,000,000 a year in wages is paid to just those employees using air operated tools. In addition, an amount of $82,600 yearly is expended for parts and labor required to keep Ryan's $300,000 worth of air hand tools in good operating condition.

Due to this growing importance, it was deemed advisable to undertake a detailed analysis of compressed air operation. Started several months ago, by the methods engineering department, this study has been completed and the recommendations made are now being carried out.

Under the direction of methods engineer John Rousch, this survey disclosed some interesting things with respect to the tools, distribution lines and sources employed in the compressed air activity.

Testing Air Tooling

ONE OF THE RYAN designed test carts which are used throughout the plant to check and test all air tools.

Cost of rehabilitating an air tool which has broken down because of defective lubrication may well run between $50 and $75. It was shown by the survey that expensive tool rapairs could be avoided in almost every instance if a system were adopted which insured the regular lubrication and testing of each tool.

In order to accomplish the lubrication and testing of tools, a mobile test cart was devised. Equipped with the test instruments and oiling devices, these carts travel through the factory to bring the analytical facilities to the tools in use.

Every air operated tool is tested each week. First, the tool is checked on the test cart's tachometer to determine its rpm. Then, a flow meter check is made to analyze its capacity. By harnessing the tool to a hydraulic pump which pumps oil against a pressure gauge, a good idea of the power which the tool develops is obtained. Finally, the tool is oiled. If defects show up in the tests, the tool is sent to the repair station for repair.

In conjunction with the development laboratory, a special test is being conducted to determine if molybdenum disulphide can be used as a tool lubricant. If this compound stands up as well as preliminary tests indicate, it will be possible to clean and relubricate the tools without dissembling them.

Costs of Air Powered Tooling

- *Lower repair costs on air tools*
- *Increased tool efficiency*
- *Greater tool life*
- *Increased availability of air power*

Distribution Lines

IN THE WORK STATION at the left, an unnecessarily long air hose has to be coiled to be used. Both hose length and coiling reduce air power. In addition, the hose is taken from the bottom of the feed pipe, thus making a water trap out of it.

AT THE RIGHT, the worker has a more powerful pneumatic drill to use because the length of air hose has been reduced. Also, the hose is now taken from the top side of the feed pipe.

One of the most revealing aspects of the survey were the pronounced effects which fittings and hoses had upon tool performance. Over 3,000 quick-disconnect type fittings are used in the plant. These should be inspected at regular intervals. After months of service, the rubber washers and metal valves in them can become worn and greatly restrict air passage.

By specifying the best type of fittings, losses due to fitting wear can be held to a minimum. The pressure drop through a good quick-disconnect fitting and valve is only 3 psi or 5 percent in tool efficiency.

A number of instances of power loss due to improper size and length of hose used were uncovered by the study. The smallest inside diameter rubber hose recommended by air tool manufacturers is 5/16 inch. Often 1/4 inch hose sizes are used and no consideration is given to lengths employed. Tests proved that as much as 1 psi per foot of hose is lost when diameters are slightly undersize. In some cases it was found that 25 feet of hose were used to serve a work station only 6 feet from the air outlet. A gain of 2 psi was made by merely uncoiling such hose.

A typical situation which can occur is one in which a ¼ inch hose from an air outlet is plugged to a hose of larger diameter which, in turn, is connected to two or more whip hoses for tools. Here, the capacity of every tool is limited by the first undersized hose and further reduced by the lengths and multiple fittings used. In such a case, tool efficiency was increased 42 percent by merely removing the first hose. Substituting ⅜ inch diameter hose for ¼ inch results in increasing tool efficiency by as much as 175 percent.

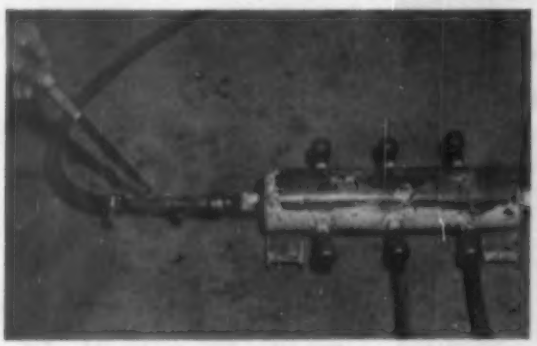
Basically, Ryan's main compressed air lines were found to be adequate but branch lines were sometimes improperly arranged. For instance, it was found that ¾ inch diameter overhead plug strips were fed by ¼ inch branch lines. In one case a greatly expended branch line was feeding 4 outlets even though another source of air was close at hand. A common practice was to take the tool outlet from the bottom of the feed pipe,

tending to make a water trap out of the outlet.

Many manifolds, or "pigs," which consist of a short length of 3 inch diameter pipe with a main inlet in one end plate and a drain cock in the other, are used. Six fittings are installed in the barrel to serve tools. Tests showed that these "pigs" could function efficiently when connected to branch lines through ¾ inch hose and ½ inch pipe fittings. Without proper supervision, these units are often converted so that they do not meet these requirements. Sometimes, the drain cocks are removed and a plug or another air fitting is inserted in its place, so that they cannot be drained.

As a direct result of the study, Ryan has standardized on ⅜ inch quick-disconnect fittings and hose lines of the shortest possible run to each work station. All fittings are inspected at regular periods and worn valves and washers replaced. Tapered valves have been replaced with square shoulder valves which permit an average of 14 percent more air to pass. Care is taken to see that not more than 10 fittings serve a ½ inch pipe inlet and hook-ups are distributed in as balanced a manner as possible. "Pigs" are served with proper sized hose and fittings and drain cocks are re-installed.

THIS SITUATION CAN OCCUR unless systematic checks are made to catch the undesirable changes. A ¼ inch air line which unduly restricts power is pointed out.



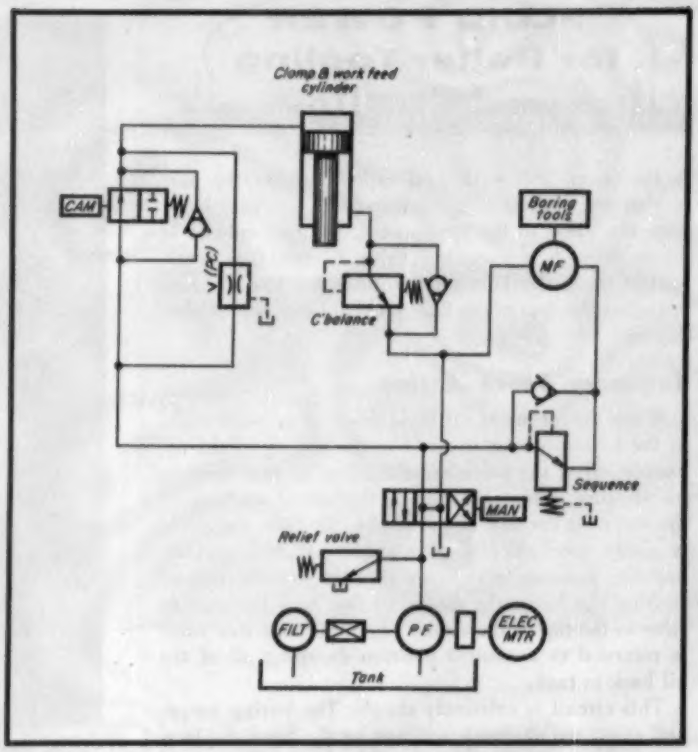
SUBSTANTIAL SAVINGS in power losses, increased facility in handling air tools and reduced floor hazards are provided by this correction of a poor installation.

Air Sources

ONE OF THE FOUR compressor stations in the plant, used to provide 3600 cubic feet of air a minute.

Four compressor stations are located in the plant to provide the necessary compressed air. The compressors develop 3600 cubic feet of air a minute at 100 psi. The survey showed that this air entered the main lines of the plant at a temperature of 100 F. As it coursed through the plant and into the hand tools, it cooled and moisture in the air condensed within the system. This water caused rust which flaked off and was blown into the tools. The moist, dirty air entering the tools removed the lubricants and introduced foreign abrasive matter which contributed to excessive maintenance costs.

By improving the design and use of water trapping facilities, Ryan improved this undesirable condition. However, the survey recommended that steps be taken to remove the water from the air as it entered the distributing system. This has been done at one compressor station and is being planned for the others. An air drier has been installed to remove the water content from the air. By means of a triethylene glycol solution, through which the compressed air is flushed, two and a half gallons of water per hour are being removed from the air.



CONSTANT CUTTING TORQUE is applied by the fluid motor. The same power source, supplying the clamp and work feed cylinder, drives the fluid motor.

FLUID MOTOR DRIVE

for rotary cutting tools

By Frank Zagar

FACED with a limited space requirement, the designers at Zagar Tool Inc., Cleveland, selected a hydraulic fluid motor drive for the boring tool spindles on a special machine. The machine bores four holes at a time in bronze air valve castings.

To do this job, Zagar used the basic machine construction they had developed as a standard drilling machine. This design, which places the cutting tools in an inverted position driven from the bottom of the machine, is particularly advantageous in the disposal of a large amount of chips.

The hydraulic motor, located in the base of the machine, is a compact power source. This axial piston constant displacement fluid motor will deliver approximately 800 in lbs of torque when driven at a speed of 1800 rpm and a pressure of 1000 psi. Torque and speed at the cutting tools can be altered by gearing the motor and tools.

On this boring application, because hydraulics is required for clamping and feeding the work, a power source was available for the fluid motor drive. The circuit is arranged so that the pump supplies oil first

FRANK ZAGAR, General Manager, Zagar Tool, Inc., Cleveland, Ohio

to the clamp and work feed cylinder. After the part is clamped, almost full oil volume is diverted by a sequence valve to the fluid motor. A small volume is taken through a metering valve to feed the work against the tools. This small volume for feeding does not affect the rpm of the fluid motor to any appreciable degree.

Sequence Valve Action

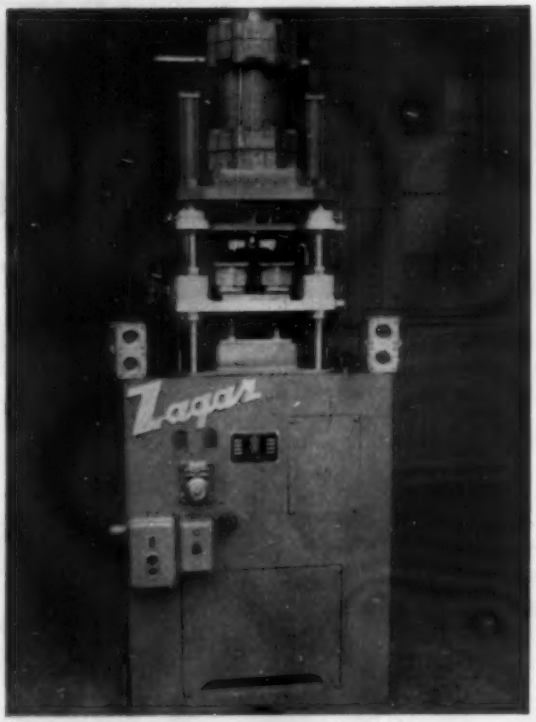
When the torque of the tools develops pressure within the hydraulic motor equal to the setting of the sequence valve, the valve remains open so that there is no pressure differential during the actual working of the units. At the end of the stroke, the four-way valve is either mechanically or manually moved into its opposite position, which reverses the flow of the oil causing the hydraulic motor to stop and the ram to raise to the top of the stroke where the four-way valve is returned to a neutral position dumping all of the oil back to tank.

This circuit is extremely simple. The boring torque and speed requirements are met by the fixed displacement pump and motor. Had variations in cutting speed been required, means for varying oil delivery to the motor could have easily been included.

Although this has proved practical for its job, it does have its limitations. One of these being that a hydraulic motor does not develop full torque except at the full speeds so that there is no appreciable, gradual slow down when the torque factor is exceeded. The hydraulic motor will stall all of a sudden. Electrical motors go into an overload and gradually slow down to a point where they stop through overload heaters. A hydraulic motor will not slow down with any degree with overload, it will cause an immediate pressure surge which releases the relief valve.

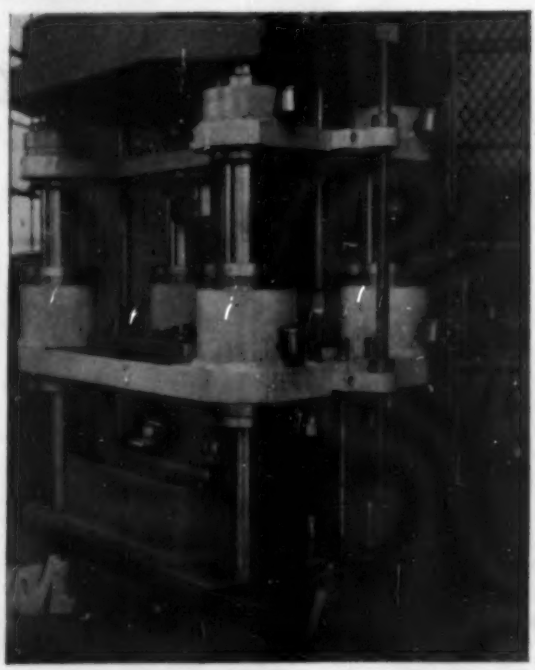
There is also the factor of efficiency, hydraulic motors are approximately 80 percent efficient and there is a subsequent generation of heat, that will raise the oil temperature. This system does have its advantages in overload protection, speed variations, a free hydraulic pusher system, stopping of spindles when not working, fire-proof, and forward and reverse rotation. The use of this application should be governed by specific conditions that do not permit the use of electric motors. This boring job was particularly successful because of its upside-down application and the space limitations, chip disposal, size of tool and applied power.

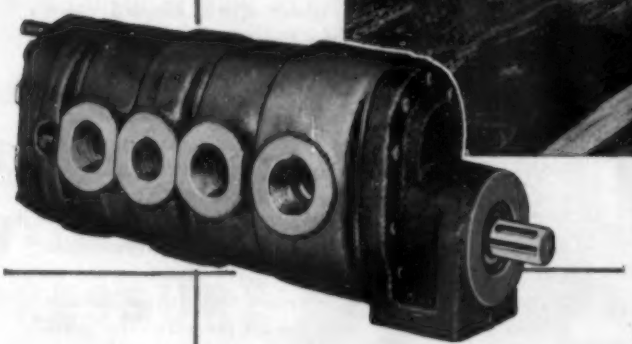
One more factor that must be considered is the momentum of the tool being driven. When the oil to the motor is shut off, this momentum will cause the hydraulic motor to act as a brake instead of a motor. At this time there is some noise developed in the motor and if the force is too heavy the motor will be damaged.



FOUR HOLES are bored from the bottom. The fluid motor is in the base of the machine. The large hydraulic cylinder on the top moves to clamp the work and feed the work platen into the tools. Raising the work off the tools is accomplished by the two small diameter air cylinders.

CLOSEUP of the work platen. Accuracy of boring is assured by the construction of the four guide posts and bushings.





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KA-48

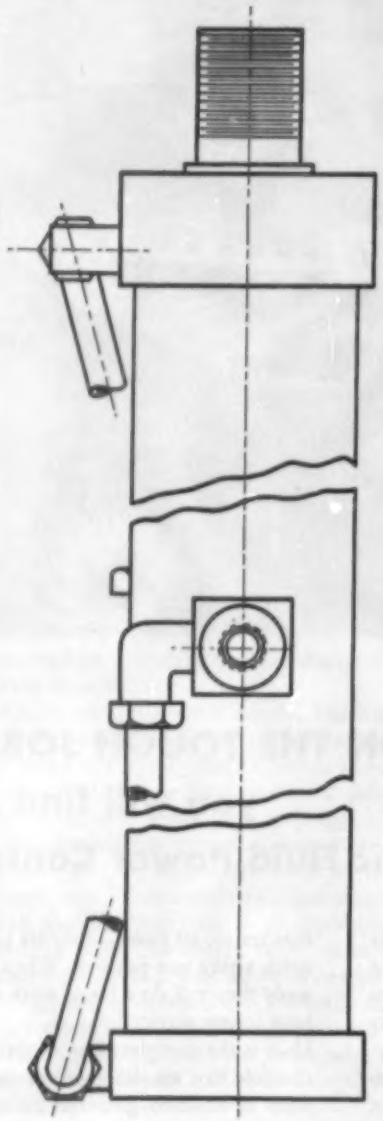
Mounting a Trunnion Cylinder . . . in limited space

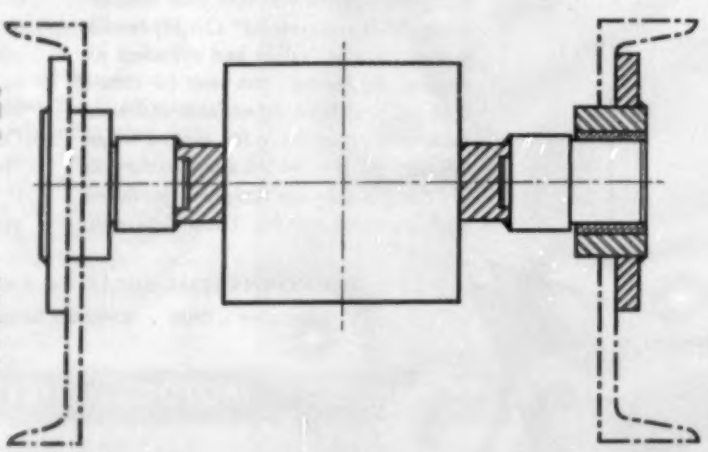
By C. B. Blake and A. M. Steel
Scovill Manufacturing Company

ONE of the problems of laying out a conveyor system is to get the operating mechanisms to function properly in the available space. Limited space often requires redesign of standard parts. In the brass mills of Scovill Manufacturing Company, Waterbury, Conn., hydraulically powered upenders and downenders are used to position coils as they move on conveyors between processing operations. Trunnion cylinders used to raise and lower the upenders have been modified to fit in the available space.

These 7 inch cylinders are located below the equipment in a concrete pit. Clearances between the cylinder and pit and the cylinder and upper structure are so limited that it has not been practical to use flexible rubber hose lines to carry the oil pressure. The available space does not allow the use of enough hose to prevent kinking and rapid wear. The fluid lines have to carry 60 gpm at 750 psi. Hose of this size is difficult to obtain.

To solve this space problem, the cylinder trunnions were redesigned as shown in the drawing. The original trunnions were removed and the new ones welded in place. The new trunnions have a pipe connection through the trunnion centerline. Ball bearing swivel joints are fastened in these connections, and the rigid oil feed lines are piped into the swivel joints.





Special trunnions have one port for a swivel joint and one port for a feed line to a cylinder port.

Layout of the trunnion cylinder mounted between structural channels. Original cylinder trunnions are cutoff and counterbored to take the new trunnions.

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Air Power CLAMPS then EJECTS Small Parts from Milling Fixture

By T. Baxter and C. Spicer

Leland Electric Canada Ltd.

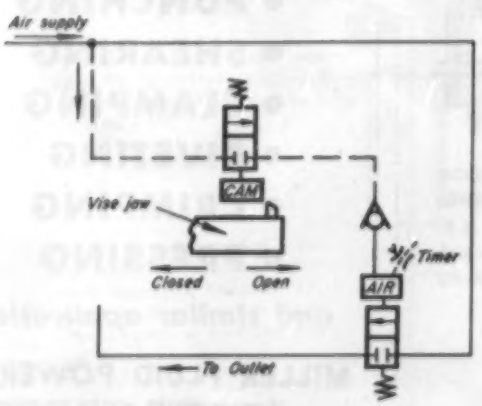
WHEN gang milling is impractical and parts must be milled singly, reducing production time can only be done by speeding up loading and unloading of the part.

Air tooling has added speed to this milling operation. The part is a brass pin which is to be straddle milled to produce a tongue. The tooling setup and air ejection circuit are shown in the drawings.

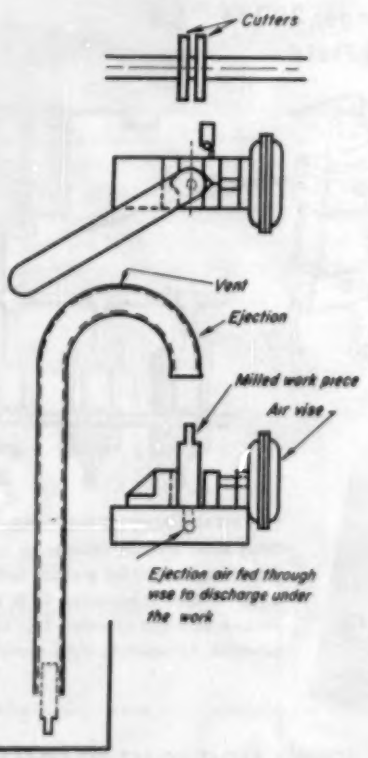
The part is inserted in a vise operated by a diaphragm type air cylinder which closes the movable jaw to clamp the work. By air-hydraulic feed, the work is carried to a pair of milling cutters. After the tongue is milled, the table with the vise is drawn back by air-hydraulic return. As the air cylinder opens the vise, an air blast from the air valve directly under work piece, blows the workpiece up into the curved tube. The blast is strong enough to carry the part around the curve of the tube where it falls into a receiving box. The top curve of the tube has three drilled holes. These holes cut down the air resistance and allow the piece to follow down the tube.

The ejection blast is timed with the release of the vise jaw. As the jaw opens, a normally closed pilot valve is tripped open to apply pilot pressure to open the main 2-way valve. The duration of the ejection blast depends on the length of time the main valve stays open. This time is controlled by adjusting a needle valve which bleeds the pilot pressure to exhaust.

EJECTION BLAST occurs when movement of the vise jaw trips open the pilot valve. Length of blast is timed by an adjustable needle valve built into the main valve.



AN AIR VISE clamps the part which is then straddle milled. After milling, as the vise opens, a blast of air blows the part through the curved tube.



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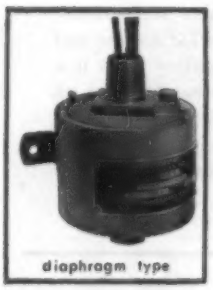
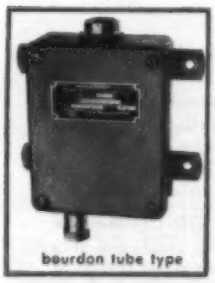
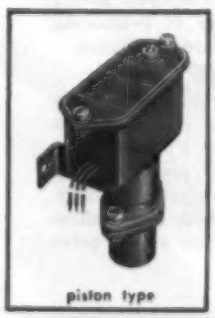

diaphragm type


bourdon tube type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Piston Pressure Switch bulletin describes in detail the entire service range from 15 to 3000 P.S.I. (7000 P.S.I. proof pressure). Belongs on Production Equipment, where millions of cycles are expected, and on Original Equipment, where flexibility and price are a factor.

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PERHAPS no difficulty is more common in hydraulic circuits than that of "unpredictable" behavior of packings made of synthetic rubber compounds in petroleum base hydraulic fluids. Far too many packings have been condemned for excessive wear or premature leakage. Hydraulic fluids have been changed from one type to another, often at considerable cost, in an effort to find a remedy. The answer is to use a compound best suited to the characteristic swell or shrink effect of a given fluid—depending on the fluid's aniline point.

The aniline point of an oil is the lowest temperature at which equal volumes of freshly distilled aniline and the oil are completely miscible. The aniline point is a test of the amount of hydrocarbons present in the oil and is a measure of the aromaticity. It is an index which enables competent rubber or mineral oil chemists to predict the exact behavior of various synthetic

Table 1—Types of Rubber-like materials

Buna-S or styrene type (wartime GR-S rubber) a co-polymer of butadiene (c. 75 percent) and styrene (c. 25 percent); resembles natural rubber closely. Weaker physically than natural rubber but more resistant to heat. Very poor resistance to oil.

Buna-N or acrylonitrile type (Hycar, Butaprene, Perbunan, Chemigum), substitutes a acrylontrile for styrene in the molecule. Only fair physical and heat resistant properties but has exceptionally good resistance to swelling action of ordinary petroleum oils.

Neoprene or chloroprene type is a polymer of chlorbutadiene. Physically stronger than Buna-N. Excellent resistance to heat; very good resistance to oils. Mineral oils of low aniline point will cause most neoprenes to swell, but with original physical properties largely retained. Oils of over 225 F aniline point can usually be used with neoprene.

Thiokol or polysulfide rubber is low in physical properties (compression set, tensile strength, elasticity, tear and abrasion resistance). They are used to advantage in applications requiring minimum of swell, low shrinkage and good aging characteristics.

Butyl or isobutyllene type (wartime GR-1 rubber) is a co-polymer of isobutylene with small amounts of other diolenes (isoprene, butatiene, etc.). Physical properties lower than natural rubber; will swell like natural rubber in petroleum. Good heat and low temperature resistance.

Silicones are semi-organic materials made basically from elements found in sand combined with radicals taken from coal and oil. Physical properties vary but are relatively low; excellent heat stability and low temperature flexibility. Good resistance against oils with high aniline points; poor against oils with low aniline point (excessive swell).

Push button production

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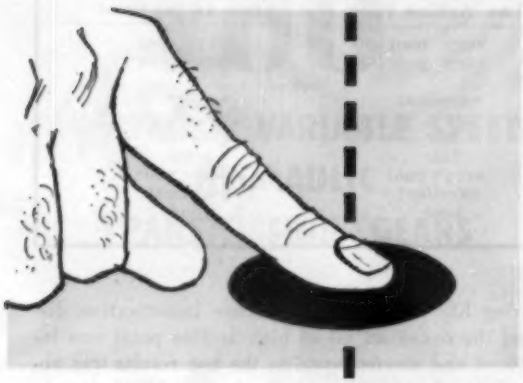

Very near! In fact, it is on the doorstep of every manufacturer, awaiting his planning the application of lately designed sources of power to his production processes. Some companies already have their plants on a nearly automatic basis, and the resultant cut in costs quickly pays for their investment.

Rivett is playing a part in this manufacturing advancement. Its air and hydraulic valves and cylinders are ideal power replacements for untold manual operations. And, more important, they are being used to power entirely original processes—offering tremendous short cuts in machining, forming, handling, finishing, etc.

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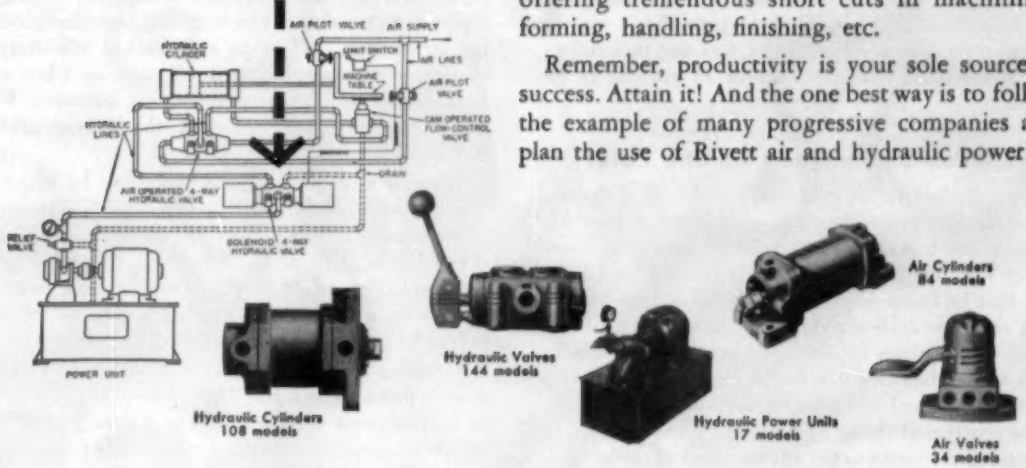

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Baltimore, Md.—Cauliflower, Inc., Baltimore National Pike, Ellicott City, Md.
Boston, Mass.—L. W. Sheehy, 1104 Park Square Bldg.
Buffalo, N. Y.—Lane Engineering, 1807 Elmwood Ave.
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High and Low Aniline Point

Table 2—Oil Resistance of High and Low Aniline Point Rubber Materials

Material	Low Aniline Point	High Aniline Point
Natural Rubber	very poor	very poor
Buna-S	very poor	very poor
Buna-N (Hycar & Butaprene) low swell	excellent	fair
(Paracril & Chemigum) high swell	fair	excellent
Neoprene	fair	good
Butyl (non-oil resistant)	very poor	very poor
Thiokol	excellent	excellent
Silicone	poor	good

rubber compounds when immersed in oils. The aniline point is expressed in degrees, Fahrenheit.

A review of representative groups of service and trouble shooting calls made by both packing and petroleum base oil company field men shows clearly that, in many cases, the difficulty was due to a difference in the basic characteristics of an oil, due to its origin.

Oil Source Determines Aniline Point

Every distinctive oil field yields fluids of a characteristic aniline point. Processing does not change the aniline point. It is not necessary for the oil user to know exactly what the aniline point is. It is important, however, that he know whether the oil has a high aniline point or a low aniline point. This information, which the oil supplier can furnish, can be used to eliminate much of the difficulty due to the incompatability of a packing compound and a petroleum base fluid.

The practice of changing a packing compound or an oil without reference to the aniline point of the oil can, and does, cause considerable trouble. For example, a leading manufacturer of agricultural equipment and implements selected packings and tested them in a high aniline point oil, which gave low swell. The combination of packing and fluid functioned very well and there was every reason to expect long service life from the packings. However, shipments were made to another part of the country where low aniline point oils were introduced into the hydraulic systems. The packings swelled, became badly worn, and the system leaked. Packing life was very short. When investigation disclosed the cause, an oil of high aniline point was introduced and service equal to the test results was obtained. Another case involved a change of "O" rings in a piston accumulator. The unit had been designed for industrial type "O" rings and worked efficiently. A careless workman substituted AN rings on a few units. Leakage on such units soon became excessive. When the proper rings were installed, the leakage problem was eliminated.

There is a simple and safe procedure by which the user can avoid packing-oil incompatability. The aniline point is used in both rubber and oil technology and is defined in a joint ASTM (D735-52aT); SAE (10R) Standard. Two oils, one with a high aniline point, the other with a low aniline point, are used as reference points for physical requirements of compounds.

Standard ASTM No. 1 oil is representative of high aniline point aircraft oils (ASTM D 471). This oil has an aniline point of 255 F and, in general, would exert minimum swelling effects on most rubber compounds.

Standard ASTM No. 3 oil is representative of low aniline point automotive lubricating oils. This group would include many of the industrial hydraulic fluids. This oil has an aniline point of 157 F and, in general, would exert maximum swelling effects on most rubber compounds.

A compound that is satisfactory for use in low aniline point oils may shrink in high aniline point oils. One that is satisfactory for high aniline point oils may swell excessively in low aniline point oils. Most com-

Table 3—Fluid Service Guide to amount of swell or shrink of rubber compounds in high and low aniline point fluids.

Type of Rubber	Buna-S	Buna-N	Neoprene	Thiokol	Butyl	Silicone
Immersion 70 hours at 212 F						
Water	10.2	9.7	7.0	45.0	4.7	3.2
ASTM No. 1 Oil	44.4	0.0	7.5	−2.0	116.0	6.5
ASTM No. 3 Oil	105.0	9.1	68.0	5.4	320.0	23.0

ASTM No. 1 oil, high aniline point oil (225 F) minimum swelling effects
ASTM No. 3 oil, low aniline point oil (157 F) maximum swelling effects

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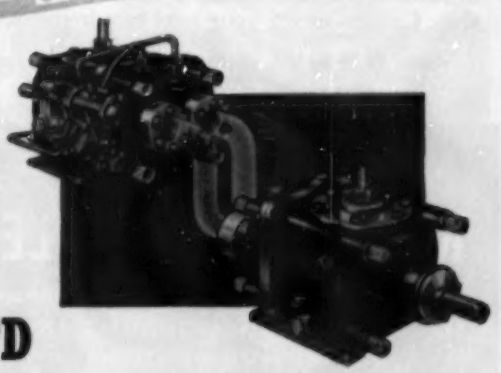

Extensive new plant has recently been installed in Sheffield, England, by Firth Vickers and Samuel Fox. The above illustrations show one of the Pickling and Annealing Lines. For precise speed control over a wide range and for accurate synchronisation of each section drive 'VSG' Hydraulic Transmission Gears were selected.

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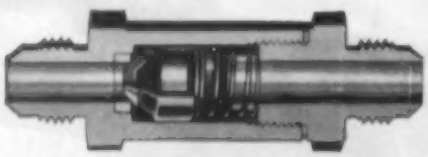

The K-1207-6 hydraulic check valve, shown, is one of the seven sizes from ¼" to 1". If you want *CHECK VALVES THAT CHECK*, these valves may fill your requirements. All are precision lapped, and their positive checking action prevents leakage and insures long service life. They are used in hydraulic actuating lines for airplane landing gear, for operating machine tools, and for forked lift trucks.

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High and Low Aniline Point

mercially available hydraulic fluids have an aniline point of about 200 F. The standard Army-Navy Hydraulic Fluid (MIL-0-5606) has an aniline point of 190 F.

Table 1 is a list of the common types of rubber-like materials used in packings. Table 2 gives the general oil resistance of both high and low aniline point fluids used with the materials. Table 3 is a fluid service guide to the amount of swell or shrink of seals made of various materials in high and low aniline point fluids.

The ASTM-SAE joint specification divides rubber compounds into three types: R, S and T. The R type

Table 4—Volume Swell of the three classes of oil resistant (Type S) compounds

Type S	ASTM No. 1 Oil	ASTM No. 3 Oil
Class SA (6 grades)	– 3 to + 5	0 to + 10 percent
Class SB (29 grades)	–20 to + 5	0 to + 40 percent
Class SC (42 grades)	–10 to +15	+10 to +140 percent

The swell figures are based upon immersion in oil for 70 hours at 212 F

covers natural and synthetic rubber materials and combinations that are not oil resistant. The T type, of synthetic or rubber-like materials, is designed for maximum resistance to both high and low temperatures or dry heat and oils at high temperatures.

The S type compounds, made in three classes, are designed for specific degrees of oil resistance. Class SA compounds are those which have very low volume swell in low aniline point oils; class SB compounds are those which have low volume swell in low aniline point oils; and class SC compounds are those which have medium swell in low aniline point oils.

If you use packings made of synthetic rubber materials or compounds and a petroleum base fluid, you can avoid a lot of unnecessary trouble. All you need to know is whether the oil has a high aniline point or a low aniline point. You must also consider any additives in the fluid which may influence packing swell. You can then select the proper oil for your packings. Buy your oil by high or low aniline point.

Acknowledgments: Table 2 is adapted from a table in Linear's "Some Facts on Synthetics and Their Selection for Sealing Applications"; Table 3 is taken from Precision Rubber Products Corporation's "Handbook on "O" Ring Packings and Dyna-Seal"; Table 4 is extracted from Tables in ASTM spec D 735-52aT.

Turn to page 32 . . .

. . . for complete information about the 1954 APPLIED HYDRAULICS Prize Paper Contest. You are eligible to compete for cash awards totaling $1200.

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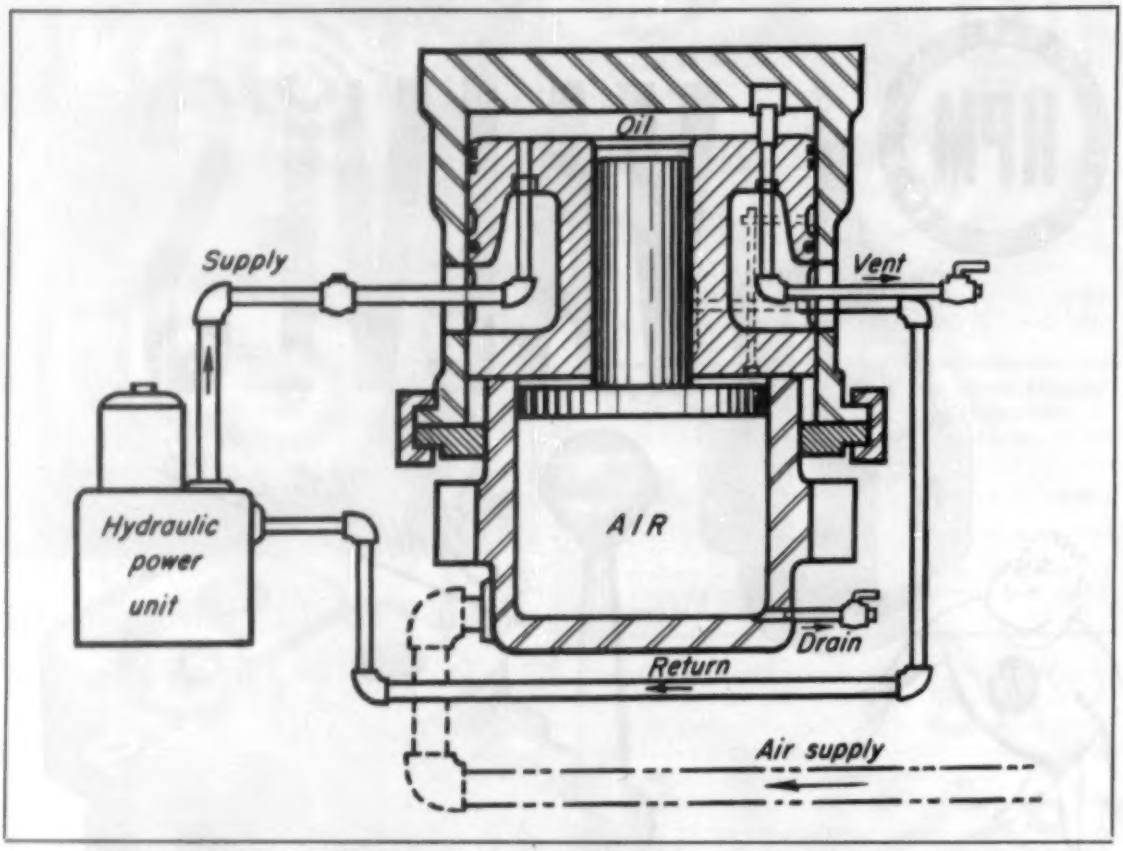

PRESS CUSHION is an air-to-oil pressure booster. The hydraulic power unit operates to makeup leakage.

FLOATING CUSHION

protects dies from overload

By Robert Soman

PRESS dies are usually expensive tooling. Repair of damage is costly and where downtime is involved, the loss of a press's high production rate becomes very expensive.

To minimize the possibility of die damage caused by double loading or by material which is too thick, the Warco Division of The Federal Machine and Welder Company, Warren, Ohio has developed an air powered oil cushion. The press dies are floated on this cushion which supports the bottom press platen.

Oil pressure in the cushion is adjustable to 1000 psi. Size of the cushion varies with press tonnage. The cushion is an air-to-oil pressure booster. Shop air pressure is piped to the blank end of the inner piston. This pressure, intensified by the ratio of blank to rod end areas, is transferred to the oil cushion.

As long as the press is not overloaded the cushion does not move. When there is an overload, causing movement of the floating cushion, an electrical switch is actuated to initiate immediate press reversal.

Success of the cushion, depends on a full oil cushion. A 1000 psi pumping unit supplies the oil for the cushion. When the cushion is full, the pumping unit is shut off. Any leakage of oil from the cushion results in the falling of the air driven piston. As this piston falls, an attached cam rod trips a limit switch to start the oil pumping unit which makes up the leakage. An air vent is included to bleed out air which has gotten into the oil chamber, and a drain valve removes oil that has leaked into the air chamber.

ROBERT SOMAN, Warco Press Division, The Federal Machine and Welder Company, Warren, Ohio

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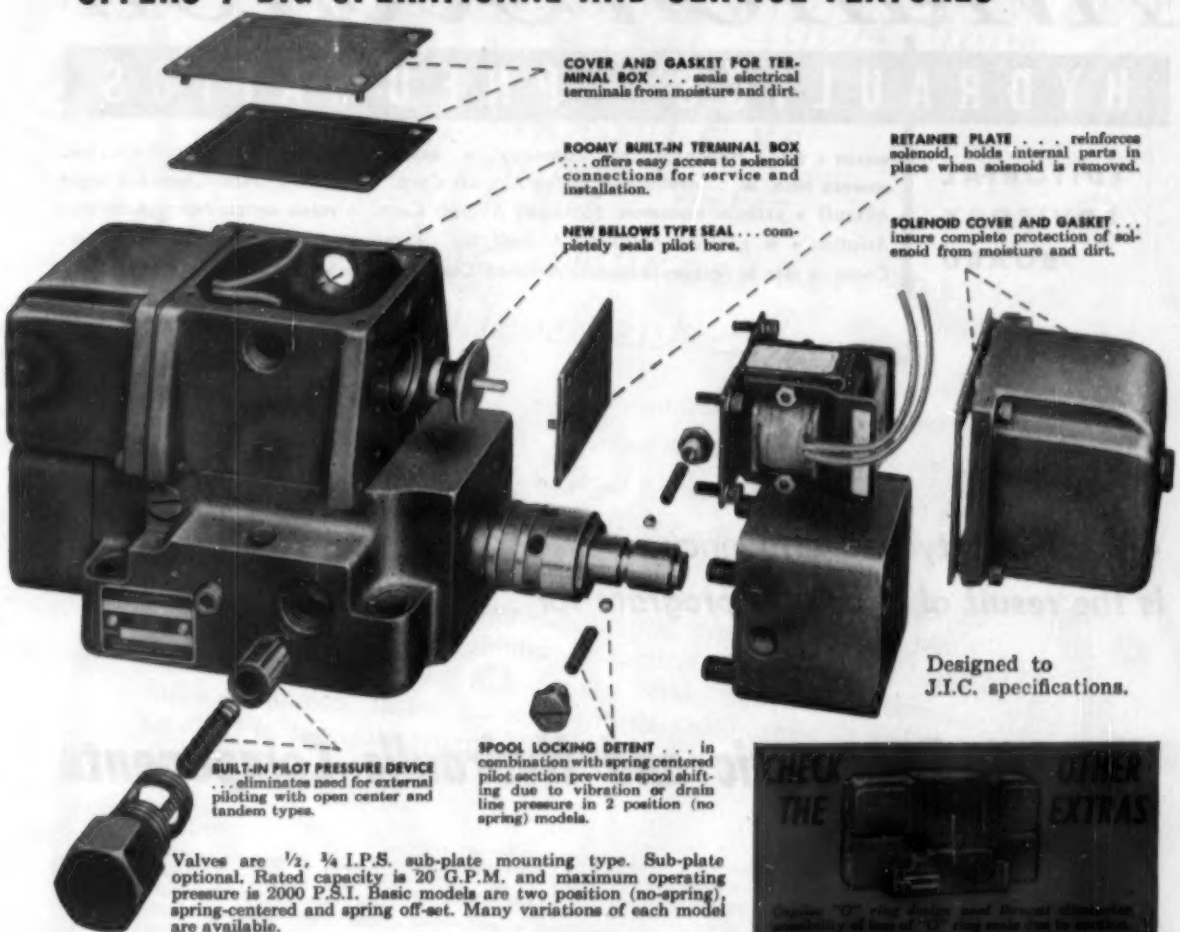

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Aircraft safety and efficiency is the result of a careful program for . . .

Testing Pneumatic and Hydraulic Components

By Harry P. Kupiec

Aircraft Equipment Testing Co.

ALL COMPONENTS, like materials designed for aircraft applications, must pass a series of rigid, thoroughgoing tests before they can be installed. A number of the major airframe manufacturers will readily admit that the greatest single factor that insures the quality of their product is testing. When all the necessary tests have been passed by a component, good service life is assured no matter what the starting point of a given component design may have been.

Testing of aircraft components may be divided into three phases or classes:

(a) Evaluation Testing
(b) Qualification Testing
(c) Production Testing.

Evaluation testing is usually associated with the exploration of new materials or new ideas. A typical example is the possible uses of titanium for hydraulic and pneumatic equipment. In such a case a new material is involved; a new design for a relief valve or some other component is created and placed on test to evaluate the good and the bad characteristics of the new product.

In other cases, all the previously known materials are used to create a lighter or a smaller configuration in the interest of saving weight or space. An evaluation test would be conducted to determine how closely this new model meets current, as well as anticipated, needs.

A good example of evaluation testing may be illustrated by an actual project conducted on a number of high temperature hydraulic seals. The samples were made up of a tough plastic shell with a silicone core. As this was an entirely new idea in "O" rings, no previ-

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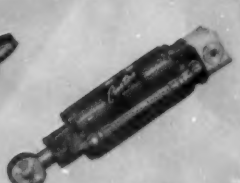

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ous performance tests had been conducted. A high temperature fluid, which had already been tested, was used, thus leaving only one unknown factor, the seals. The temperatures used were in excess of 200 F; the packings were installed in typical aircraft type hydraulic cylinders. Although these seals showed very high promise, and theoretically should have operated satisfactorily, the seals did not have a satisfactory life and could not possibly have been used in an aircraft hydraulic system. Had these seals been used in an airplane, the damage they might have caused would have been, conservatively speaking, 50 to 100 times as much as the cost of the evaluation test.

Aircraft designs are always made with one important interest in mind: that of saving weight. Hydraulic and pneumatic units are designed to do their jobs with only enough weight to do specific jobs and with no ounces left over. Over the life span of an airplane a pound of weight can mean the saving or losing of thousands of dollars. Pay loads bring in revenue, dead weight does not. Military aircraft can carry more fuel and more armament when the weight of an empty airplane is reduced to its basic minimum. For this reason, many engineers design to a philosophy which emphasizes underweight. The weaknesses can then be found during evaluation tests, when the very minor changes usually necessary can be made to "beef up" the parts to meet requirements.

Qualification tests usually follow an evaluation program. Qualification tests are of two main types:

(a) Military Standard Envelopes

(b) Non-Standard Envelopes

Qualification testing normally comprises the series of tests listed in a "standard" specification. In the case of aircraft, these standard specifications are known as "Military" or government documents, prepared jointly with members of the aircraft industry.

These requirements consist of proof tests, performance tests, life cycle tests and extreme temperature tests. Some units require salt spray tests, sand and dust tests, vibration tests and bacteriological fungus tests. It is usually necessary to have a local government representative present to witness these tests and sign the certified copies of the report.

A sample to be qualification tested usually has been subjected to evaluation tests; it is generally known that such a unit should successfully pass the qualification tests.

Standardization of parts in aircraft is used whenever practicable and possible. Standardization both in geometry and in performance is a primary consideration. There is a large percentage of hydraulic and pneumatic components which are manufactured to Military Specifications for complete interchangeability; however, there are some units which meet only a performance specification. All units must meet basic performance requirements.

Qualification tests may be conducted by component manufacturers, airframe manufacturers or by an approved independent laboratory. These tests are also conducted by Air Force and Bureau of Aeronautics Laboratories. After having passed a qualification test, a component is authorized for use on an airplane, but this is not the end of testing.

When samples have successfully passed qualification tests, they are approved as "qualified" or "standard" units.

Qualified products are always given a few tests before being shipped to a customer. This is not only standard procedure for qualified units, but is rapidly becoming a fixed procedure for all types of units for aircraft and other use. The pre-shipping tests are known as production tests; among hydraulic and pneumatic

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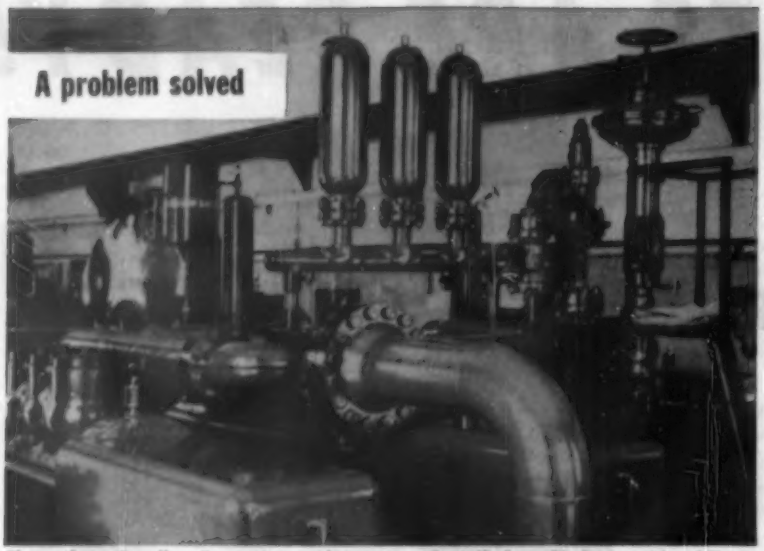

These three 5-gallon Greer Accumulators were installed on discharge side of Prescott double-acting duplex pump. Surge reduction was remarkable. See below.

CASE HISTORY OF PORTLAND PIPELINE PROVES:

Greer Accumulators Cut Pump Pulsations 53%

Oil pipeline and pump breakage were reduced from once a month to zero after installation of Greer Accumulators at pumping stations.

Large pump surges are dangerous. They crack pipelines, break pump barrels, shock engine crank and piston rods into failure. Greer has proved these failures unnecessary.

Hydrauliscope photos graphically prove pump pulsations were made harmless resulting in no further line breakage.

Comprehensive tests made at all eight pumping stations of the Portland, Maine to Montreal, Canada pipeline prove that Greer Accumulators will absorb pulses and render surges harmless.

Many pipeline systems—perhaps most—still suffer the costly consequences of these pressure surges. If yours is one of these, we urge you to investigate the simple and certain way to stop this waste.

Our experienced hydraulic engineers will demonstrate the Greer Accumulator to you without obligation. Please call or write.

How accumulator works: When system fluid is forced into accumulator under pressure, the gas in bag is compressed. Thus the rubber bag absorbs impact to an extraordinary degree. Write or call for Brochure 500 that gives detailed data on pump pulsation dampening. *U. S. Pats. under Oiser Lic.*

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groups these include a proof and a leakage test. Sometimes a functional test is given, cycling the unit a half dozen times to prove out its functioning.

Flexible hose assemblies are given several types of qualification tests including a fire test at 1800 F. A flexible hose on a tractor presents no particular problem should the tractor catch fire, but on an aircraft engine, a hose failure could cause the loss of the airplane. A very sensible requirement was set up for fire resistance of hose assemblies. The hose assembly must withstand 1800 F temperature with its fluid circulating through it at 190 F at a rate of flow equal to 4 to 6 times the square of the inside diameter expressed in inches. The ten minute time limit gives the pilot sufficient time to apply emergency procedures for a fire. He may use extinguishing apparatus or make a forced landing.

Production testing is that phase which deals with manufactured components of a production run, no matter the size of the run. Experience has shown the need for proof pressure tests and leakage tests. Materials can be weak or porous without visually showing such faults. Blow holes in castings may have escaped impregnation checks and x-ray examinations. Wrought materials may have hidden flaws. Flexible hoses, a very popular hydraulic component, may have weak spots which are revealed only by pressure tests.

Hidden weaknesses, if not found, can cause an "accident" in which human life is involved. There is an economic value as well. Hydraulic tubing, for instance, is tested in fabricated forms (with nuts and sleeves attached) before installation because it is cheaper to test fifty such pieces than it is to "tear out" a single piece, if it is bad. The same principle applies to other components, whether they are hydraulic, pneumatic, electric or any other type.

Production testing is now being so extensively used, that in-process testing is also becoming established as a production check. Before the final product is assembled, its de-

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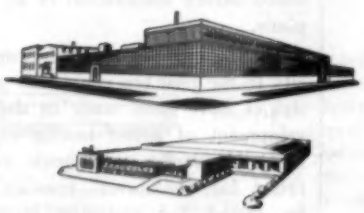

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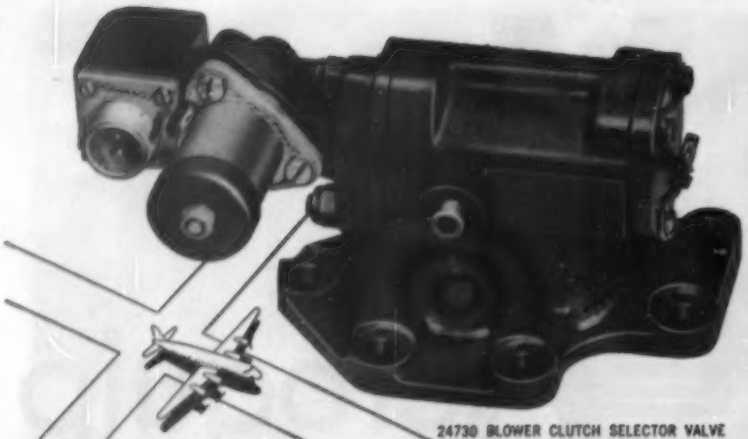

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tail parts are being subjected to critical tests and measurements.

Valve bodies, for example, are proof tested before they reach final assembly, saving the cost of assembly and disassembly of a unit that would have rejected anyway. Poppet and poppet seats are similarly tested before assembly. Non-interchangeable sub-assemblies such as lapped and honed valves are tested and mated together in pairs. In such cases, the fit of the spool in the body is measured in terms of leakage under pressure. Actual dimensions are not needed and are not used. Pistons in high pressure pumps are matched the same way.

Efficiencies of hydraulic and pneumatic components are highly important when applied to aircraft. Hydraulic actuating cylinders, pumps and other elements are production tested for efficiency. Any efficiency under a relatively high standard (often 90 percent) means rejection for a given component.

The engineering time for designing a medium bomber before World War II was approximately 300,000 man hours. Today the design time required is in excess of 3,000,000 man hours. Not only is the machine more complex, but more engineering test time is allowed for component testing, sub-assembly testing and system testing. Entire hydraulic, control and other systems are fully tested before installation in an airplane.

Testing has become such a necessity in the past ten years that great strides have been made in the development of better testing equipment. Hydraulic components which failed for "unknown" reasons can be tested for pressure impulses which can't be read by ordinary gauges. The use of the cathode-ray oscilloscope shows instantly what pressure values are encountered and what destructive results are present. Rates of flow can be determined at any temperature and almost any pressure by means of electronic flow meters. Pressure and flow can be recorded for analysis and future record, as well as proof of qualification for hydraulic and pneumatic components. Test programs, utilizing modern instruments, have become an established part of modern production for quality products.

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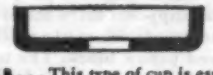

TYPE B . . . This type of cup is essentially the same as Type A, except that the leading edge of the lip is square instead of beveled. This construction provides greater strength where the lip may be exposed to distortion or excessive wear due to openings in cylinder walls.

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You have your choice of a number of styles and compositions of these precision-moulded cups to meet temperatures and pressures encountered in hydraulically operated equipment. Types "A" and "B," shown here, are most widely used on inside-packed pistons with the outside edge or lip contacting the cylinder wall or liner. Other types are available, however, for other services.

If you would like more information on these or other types of Johns-Manville Custom-Made Piston Packings, get in touch with your Johns-Manville Packings Distributor, or write Johns-Manville, Box 60, New York 16, N. Y.

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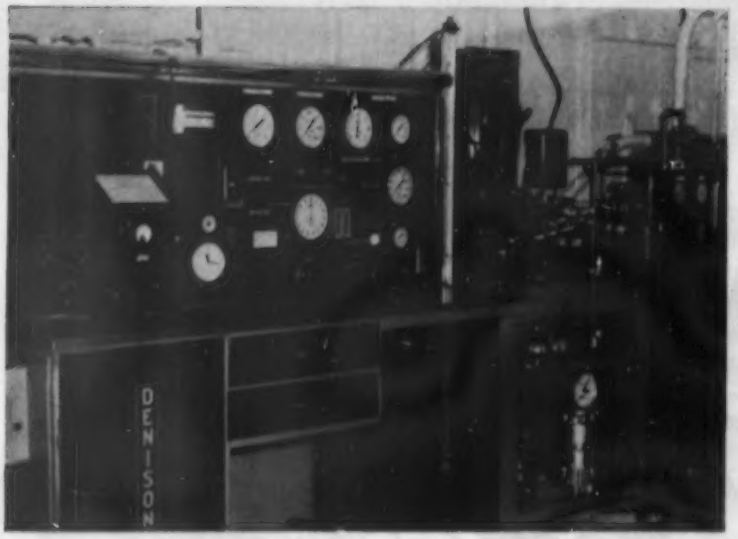


NOW ADAPTABLE TO COMMERCIAL PUMPS, this test stand was originally designed to produce stress conditions for testing aircraft hydraulic pumps. It simulates actual flight action —heat and cold extremes, altitude pressures, running time, etc. Gauges on instrument panel show inlet readings, outlet pressures, pump output volume, fluid motor drive speed, inlet, outlet, and case cooling line pressures, and case pressure.

Design of an Aircraft Pump Test Stand

All trial conditions are produced by components combined into one piece of equipment

END VIEW of the test stand shows welded angle iron platform that supports drive housing components—fluid motor, flywheel, and pillow block. The test pump fluid load system is below the platform within the test stand framework. On this smaller panel are mounted automatic safety devices and drive shaft lubricators. Tachometer and pyrometer pick-ups are mounted around the shaft.

By Roland N. Crossley

DESIGNED and built to ground-test the performance and endurance of aircraft hydraulic pumps in accordance with MIL-P-7740, the test stand, shown in the photographs, is compact and versatile. A dynamometer feature is combined with the cold test, fluid load and supercharge features.

Measurement and Stress Conditions

Each testing procedure measures the following characteristics: pressure at inlet and outlet and pump case; rpm of pump; torque of the shaft for determination of HP input—efficiency is calculated by these readings plus those of pressure and delivery; delivery at various inlet conditions; leakage past pump seal; internal leakage; cooling flow required to prevent overheating from internal friction; temperatures at inlet, outlet, cooling line, and reservoir; and total running time. The various stress conditions produced by the test stand to simulate actual operation are: extremes of heat and cold; cycling of pump load for a given length of time; altitude simulation from sea level to 60,000 feet by means of low atmospheric pressure in test pump reservoir and pump shaft seal chamber; misalignment of pump shaft; and supercharging of oil pressure supplied to pump up to 125 psi, or reducing pressure to 3 inches mercury abs.

Components

The prime mover is an oil hydraulic pumping unit equipped with a standard 75 hp electric motor, a variable volume cylinder controlled pump, and a remotely controlled speed control valve—all mounted on a standard 165 gallon oil reservoir. A fluid motor drives the pump being tested. The speed of the fluid motor is determined by the setting of the speed control valve, which is kept nearly constant regardless of the load on the test pump. A double universal joint allows an out-of-line connection of the test pump to the fluid motor shaft. A dynamically balanced flywheel, located between the universal joint and the fluid motor, prevents the torsional vibration of the offset universal joint from entering the fluid drive motor but is transmitted to the test pump. A heat exchanger, with automatic temperature control, holds the temperature of oil in the test pump at any desired level. The shaft bearings of the test stand are lubricated by mist oil from an independent system.

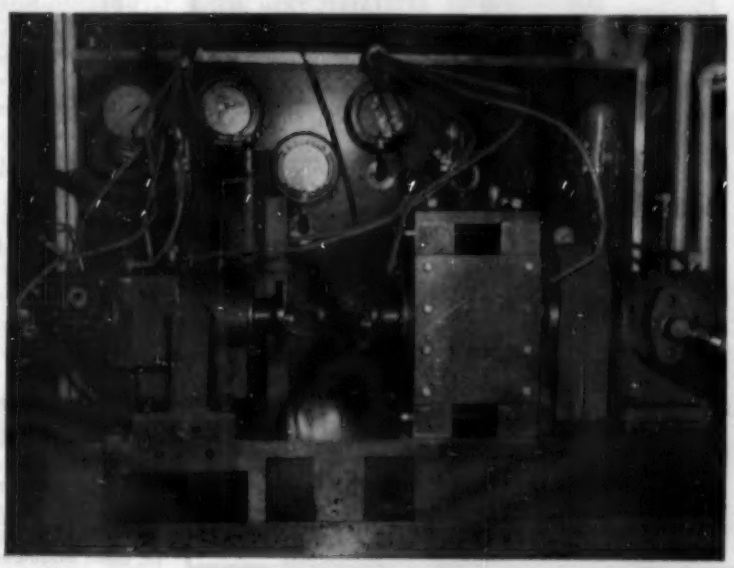
ROLAND N. CROSSLEY, Project Engineer, The Denison Engineering Co., Columbus, Ohio

Instruments

Inlet readings of the test pump are obtained from three gauges—compound, pressure, and absolute manometer; outlet pressures are obtained from either of two gauges—one that ranges from zero to 8,000 psi and another from zero to 6,000 psi. Output volume is also measured by a positive displacement electric flow meter with remote and direct reading dials. Drive speed of the fluid motor is indicated by an electric tachometer that measures up to 10,500 rpm. A thermocouple-type temperature indicator is used for the pump inlet, outlet and case cooling line. A vacuum gauge records pump seal pressures and there is also a gauge to measure case pressure. All instruments are mounted in plain view on the instrument panel.

Loading System

Incorporated within the stand is a complete and self-contained hydraulic system for loading the pump under test. A 20 gallon reservoir, containing a filter and immersion heater, is built into the base of the test stand under the test pump mounting pad. From the reservoir,



IN THIS VIEW of the coupling set-up, the universal joint is shown. This is used for misalignment tests. Test pump is at left, flywheel and fluid motor at right.

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the fluid circulates in a closed system to the test pump; then passes through cycling and relief valves that cause the system pressure to cycle from maximum to minimum in any time interval between 15 seconds and 27½ minutes. Also in the circuit are a heat exchanger, a flow meter, and a filter. Low pressures are obtainable within the reservoir to 3½ inches Hg abs. by means of a vacuum pump.

Safety Devices

A number of safety devices protect the testing equipment from any damage that might be caused by leakage or excessive temperatures and makes automatic operation possible without constant supervision. Various types of electrical safety switches are connected in series. These in turn are connected to the solenoid of the electric starter that controls the entire system. Thus, if any interruption occurs, the test stand immediately stops.

These controls are connected so that the following abnormal conditions will stop the test stand: a pressure drop in either the drive or test pump hydraulic circuit, excess temperature (can be set above 150° F.), low oil level in any reservoir, and a drop of air pressure supplying the lubricator system. To start the test stand, these switches must be by-passed by turning a selector switch to "manual" position. As soon as pressure is up to normal and all other conditions are satisfactory, the switch may be turned to "automatic" position; then the system is protected by the safety switches.

Operation

When the test pump has been secured and all fittings are in place, both the electric motor and the lubricator are started. And, since the hydraulic driving system is started under no load, a relief valve is adjusted to bring pressure up; then the speed control valve is cut in.

The test pump hydraulic system can be adjusted in a number of ways, depending on the conditions to be produced. First, the system pressure is regulated for its high-low limits, *if* the pressure is to be cycled. Next, the inlet volume is either pressurized or a vacuum is applied; then the pump seal may have a vacuum applied. Finally, the reservoir heaters are turned on, if desired. This puts the system in full operation, and all measurements and readings can be made as the pump is tested.

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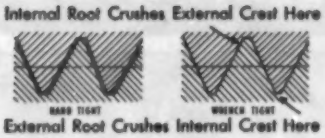

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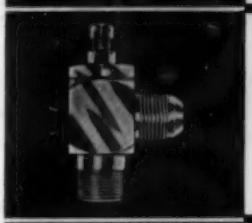

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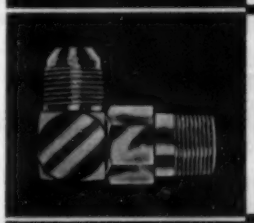

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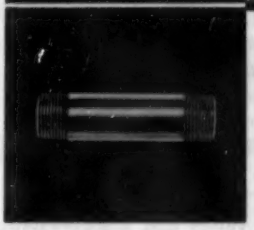

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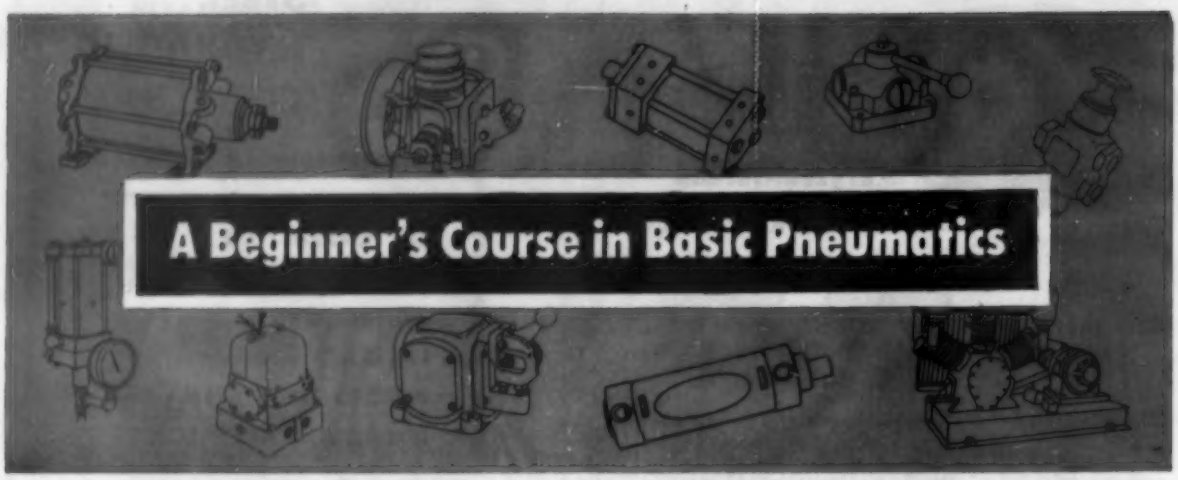

Section III Power and Working Elements

Air Valves

Part 7

Sliding Plunger Type Air Valves

EASE of operation is the distinguishing feature of sliding plunger type valves. This smooth easy action is only had with a truly balanced type valve. The sliding plunger type valve Figure 1, is definitely in perfect balance.

These valves being in perfect balance allow the operator to actuate the valves with only a touch of the finger tips. Even though the valve is handling full line pressure, the sliding valve plunger is very easily positioned. Ease of operation is very important when considering fatigue of the operator on a modern production line. It should be especially noted that the plunger will always remain in the position where it was last left. This is another feature that is only had with a balanced type valve.

Many applications require valves that are operated with direct acting solenoids. The sliding plunger type valve, being fully balanced and easily operated, is ideally suited for direct solenoid operation.

The smooth easy operation of the plunger type valve reduces the wear on packings to a very minimum. The polished plungers used in these valves take on a higher polish as the valves are used. This results in valves that will give millions upon millions of operations without any leakage. The packings wipe the plunger clean of any dirt or scale, allowing it to be discharged from the valve without damage to packings or plungers.

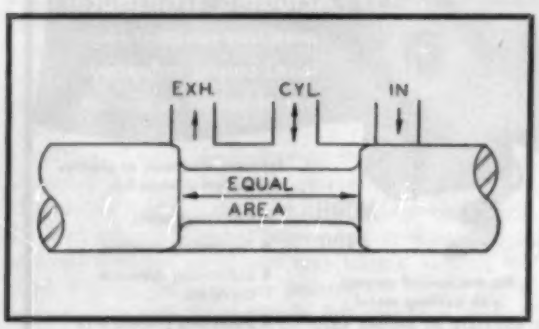

FIG. 1. SMOOTH operation of the plunger type valve, which requires little effort from the operator, is the result of the balanced plunger design.

An absolute tight seal is achieved with the plunger type valve whether it is controlling vacuum, low or high pressure air. As the pressure increases, the seal becomes tight. Like any air operated device, it is quite

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Plunger Type Air Valves

important that the sliding plunger type valve receive some lubrication.

Another important feature of the sliding plunger type valve is the ease of maintenance. Valves are very easily repacked without removing the valve from the air line. No special tools are required. There is no special hand fitting, lapping or honing of parts. There are no permanent seats to be lapped in place.

Another distinguishing feature of the plunger type valve is the simplicity of design. This basic design embodies a sliding plunger moving through a series of packings, separated by spacers, which seal the air in an "ON" or "OFF" position.

Variety of Valve Porting

This principal is incorporated in all valves, two-way, three-way open end exhaust, four-way open end exhaust and the four-way piped exhaust. See Figures 2, 3 and 4. It should also be noted that the same minimum number of moving parts are used in all the above valves.

Simplicity of design, symmetric valve body ends and the smooth easy action of the plunger type valve gives a unique combination. This combination allows use of many different control methods.

Basic methods of control are: knob, lever, cam, clevis, foot, treadle, cylinder, diaphragm, solenoid and solenoid pilot valve. Many valves can be fitted with spring return, others with double controls.

Three position valves are available in both the tandem and conventional types. The conventional type three position valves, Figure 5, are furnished:

(a) With all ports blocked in the neutral position
(b) With cylinder ports open to exhaust in the neutral position
(c) With cylinder ports open to both supply and exhaust in the neutral position

The latter is often used with constant displacement hydraulic pumps for controlling low pressure fluid.

The spring return to neutral valve, Figure 6, is used in many applications. This valve can be controlled with double acting cylinder (shown) lever, treadle, clevis and knob. Panel mounted valves are a favorite with instrument men and offers a push-button control for air circuits.

Many excellent design principals for plunger operated valves are employed in solenoid pilot operated valves. Outstanding features of this valve, Figure 7, are:

1. Plunger is totally enclosed and floats on rubber, reducing wear and friction to a minimum.
2. All parts are totally enclosed, thereby excluding dust and dirt.
3. Absence of spring in main valve body. Air positions plunger in both directions.

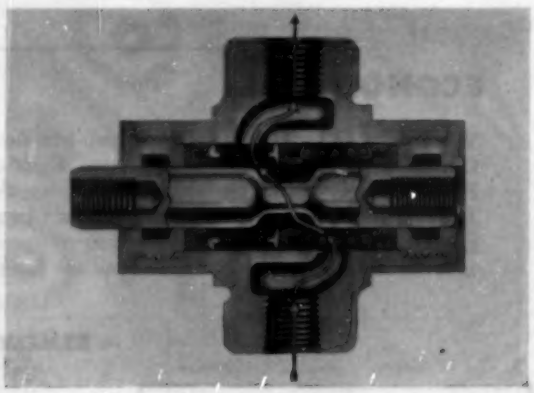
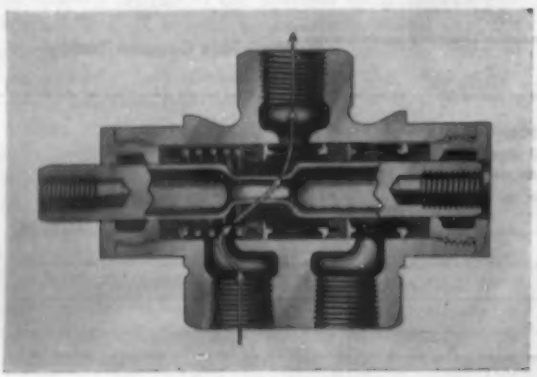
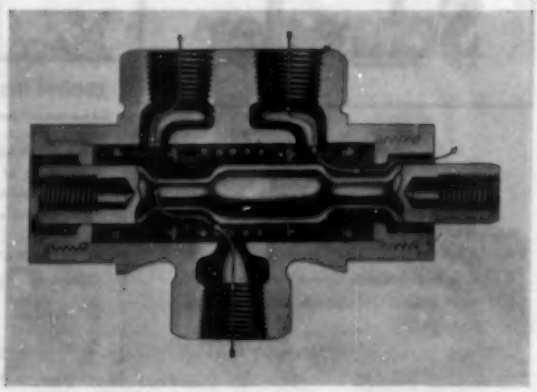


FIG. 2. RIGHT—Cross-section of two-way plunger type valve.

FIG. 3. LOWER LEFT—Three-way piped exhaust valve.

FIG. 4. LOWER RIGHT—Four-way open end exhaust valve. All plunger valves may be arranged for mechanical, manual, pilot or electrical operation.





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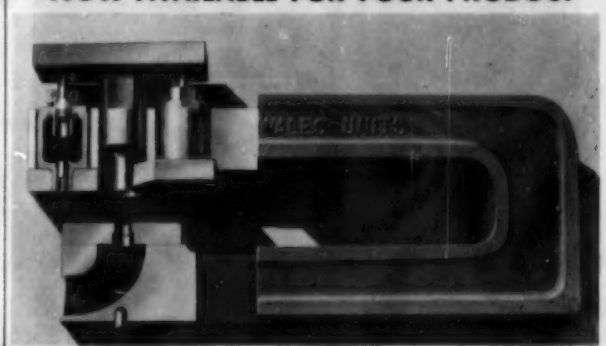
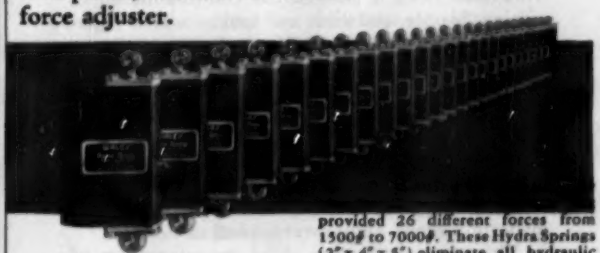


Showing cut-away view of Wales Type "HS" Hole Punching Unit for punching and stripping material up to 3/4" thick with a pair of Wales Hydra Springs which provide stripping pressure heretofore unobtainable.

Hydra Springs deliver up to 1000% more force in the same space as mechanical springs, simplifying spring applications by use of the compressibility of special liquids called Wales Liquid Comproils. Unlimited spring characteristics in any one Wales Hydra Spring are possible through changing Comproils, volumes or built-in force adjuster.

COMPARISON: The small, compact Wales Hydra Spring delivered as much force and stroke as the big caged railroad type coil spring.



provided 26 different forces from 1500# to 7000#. These Hydra Springs (2" x 4" x 5") eliminate all hydraulic piping, accumulators, etc. Each equals a mechanical wire coil spring 18" x 6" dia., 1".

SEE THE AMAZING DEMONSTRATION OF THE WALES HYDRA SPRING IN BOOTH 1830 AT THE ASTE INDUSTRIAL EXPOSITION, APRIL 26-30 IN PHILADELPHIA.

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INDUSTRIAL PRODUCTS DIVISION WILMERDING, PENNA.

Factory Branch: Emeryville, Calif.
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110 Circle 136 on Reader Service Card

Plunger Type Air Valves

4. At no time is there a side thrust applied to the plunger.

The plunger type valve does not waste line pressure when switching from one port to another. The inlet port is always completely closed before the exhaust port is opened. See Figure 17. This is not true of the poppet type valve which allows the inlet port to be open to the exhaust port when switching from one port to another. The smooth easy action of the plunger type valve is in direct contrast to the hammer like blows of the poppet on the valve body seats in the poppet type valves.

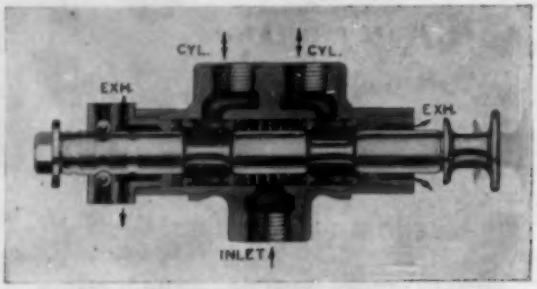

FIG. 5. THREE POSITION, manually oprated air valve with detents. With this valve in the neutral position all ports are blocked.

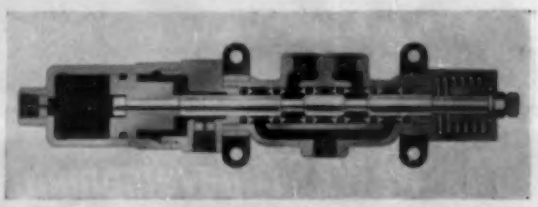

FIG. 6. THIS SPRING returned, three position valve is controlled by pilot pressure on the double acting pilot cylinder.

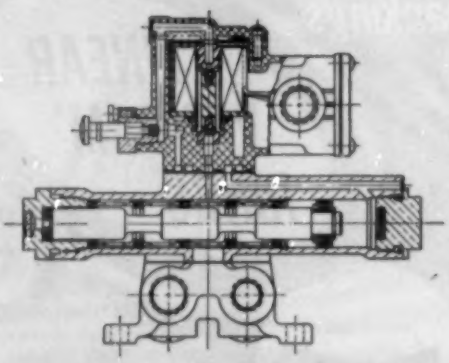

FIG. 7. MOVEMENT of the solenoid controlled, pilot operated air valve is initiated by electrical push button, limit switch or timer.

We are indebted to V. M. Weltzien, chief engineer, Valvair Corporation for the preparation of this article.

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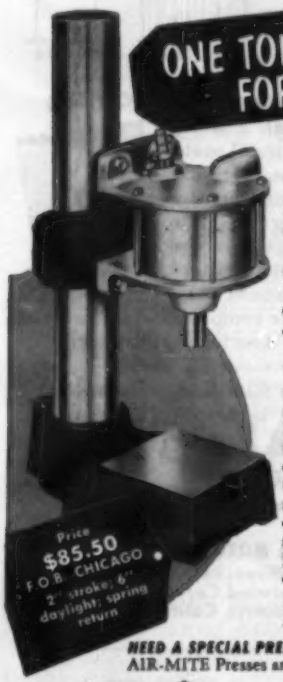

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NATIONAL OIL SEAL LOGBOOK

Write our Redwood City office for reprints of this Logbook page

Sealing News & Tips

Using high-pressure National O-Rings in low-pressure Sprague nylon wiper motor

Skilled engineering plus a new solution to an old sealing problem are found in the new Sprague "Mighty Midget" nylon windshield wiper motor.

The compact motor, designed for truck, bus, railway and aircraft use, weighs just 10 ounces. It is molded from DuPont Nylon and has only three moving parts. Leakage must be held to zero since, in vehicle applications, pressure is obtained from air brake systems. The air supply often contains detergent oils, dust, abrasive grit and moisture. Sealing must be positive and enduring despite operating temperatures from –45° to 200°F and the extreme wear resistance of molded nylon. The motor operates on 5 P.S.I. to 120 P.S.I. air, yet despite low pressure, high pressure O-Rings were accommodated by modifying design of the O-Ring retainers.

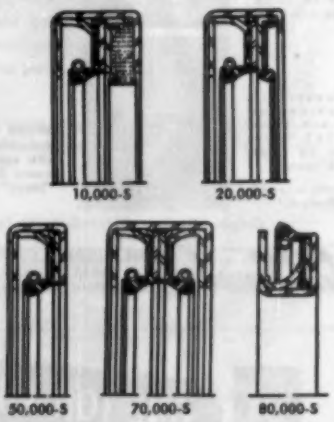
Sprague selected National O-Rings because they "compounded the specific material which satisfactorily meets the wide range of conditions to which our motors are subject." Sprague engineers also reported "minimum sticking" from National O-Rings. In numerous tests, these rings survived 5,000,000 cycles without noticeable wear. In one test, National O-Rings were operating satisfactorily after 19,000,000 strokes.

National O-Rings, like National Syntech* and National leather Oil Seals, are quality products, designed and produced by ultra-modern, precision manufacturing methods. Your National Applications Engineer has complete information. Call him for assistance next time you specify O-Rings or Oil Seals. He is backed up by the world's largest exclusive manufacturer of O-Rings and Oil Seals.

Figure 1—Sprague Nylon Windshield Wiper Motor

*T.M. Reg.

Standard-design National Syntech* Oil Seals are widely used in applications where intermittent temperatures reach 250°F, speeds reach 3,600 F.P.M. and run-out reaches .030 total indicator. These basic designs employ rigid, accurately manufactured steel outer cases, precision-tensioned springs and accurately molded and trimmed Syntech sealing lips. Syntech is unaffected by water, detergents, most lubricants and industrial fluids. Typical designs are shown below.



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DETROIT, MICH. . . . . *736 Lothrop Avenue, TRinity 1-6363*
DOWNEY (Los Angeles Co.), CALIF. . *11634 Patten Rd., TOpas 2-8166*
MILWAUKEE, WIS. . . *647 West Virginia Street, BRoadway 1-3234*
NEWARK, N. J. . *Suite 814, 1180 Raymond Blvd., Mitchell 2-7586*
REDWOOD CITY, CALIF. . . *Broadway and National, EMerson 6-3861*
WICHITA, KANSAS . . . . *519 South Broadway, Wichita 2-6971*

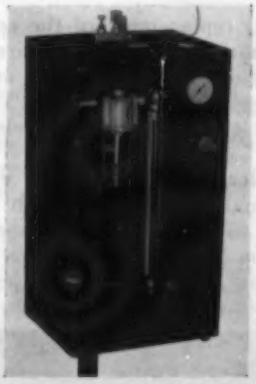
NEW PRODUCTS

Components, tools and equipment designed to improve operation of fluid power systems are described here . . . for more information fill in and mail the post card bound in this issue.

Continued from page 14

COOLING UNIT
. . . for cutting tools

Designation: Lo-Jet Acro
Features: The coolant system is physically more compact and presents a master panel control



for precise and constant spray regulation. It comes complete with a pedestal, for around the plant mobility, and brackets for permanent location installation. The spray mix control is mounted on the top of the unit, and is connected with flexible tubes of any specified length so that the control can be moved and installed at the desired location close to the cutting operation.

Air Conversion Research Corp.
Chicago 18, Illinois
Circle 179 on Reader Service Card

PRESSURE SWITCH
. . . for 400 to 3500 psi

Designation: PreReg
Design: Adjustment of working pressure is easily made and the normal operating differential of 250 to 300 psi is maintained over the entire range with only the slightest variation at the extremes of ambient temperature.
Construction: The switch employs a new principle that reduces its weight to 8 oz. and yet enables it to withstand bursting pressures up to 7500

psi without leakage, loss of ability to recycle to its original setting or damage to working parts.
Specifications: Within working limits of 400 to 3500 psi, the switch responds to a minimum differential of 200 psi. It is a single-pole double throw unit, normally closed, rated for 10 amperes at 28 VDC at 50,000 feet. Made of aluminum and stainless steel.

Prereg Manufacturing, Inc.,
Stamford, Conn.
Circle 180 on Reader Service Card

4-WAY VALVE
. . . solenoid controlled pilot operated

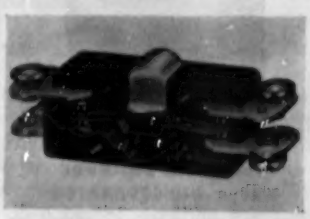
Designation: QF, QM, QJ Series

Size: ½ and ¾ in I.P.S.
Features: Available in 2 position, spring centered and spring offset models. Solenoid covers are gasketed to insure complete protection from moisture and dirt. Built in terminal box offers easy access to solenoid leads. Bellows type seal on pilot spool prevents external leakage. Two position model offers optional spool locking device to prevent spool shifting due to vibration or pressure in drain line. Additional features include full selection of spool types, throttle chokes to control speed of shifting, and complete range of voltages.
Specification: For volumes up to 20 gpm, operating pressures up to 2000 psi.

Double A Products Co.,
Manchester, Michigan
Circle 181 on Reader Service Card

SNAP-ACTION SWITCH
. . . for general purpose applications

Design: The positive rapid snap action is independent of the speed of actuation. Self-aligning



springs provide the desired wiping action of the contacts and provides extremely long life of the switch. The double break contacts provide two separate circuits and increase the capacity of the switch. The silver contacts assure maximum conductivity and ample overload capacity.
Features: The switch is available in 24 models which includes 8 re-set switch models; single-pole, single throw, normally opened or closed, single-

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HOUDAILLE-HERSHEY CORP.

New Products

Continued

pole, double throw, normally opened or closed. The variety of housings available with this basic unit includes splash-proof die cast, general purpose and hermetically sealed cases. Where switches are not exposed to dirt, dust or lubricants, the switch can be used without metal housing.

Specifications: The durable plastic case measures 1¼ in. long, ½ in. wide and ½ in. high, permitting compact designs and applications.

Electro-Snap Switch & Mfg. Co., Chicago, Illinois

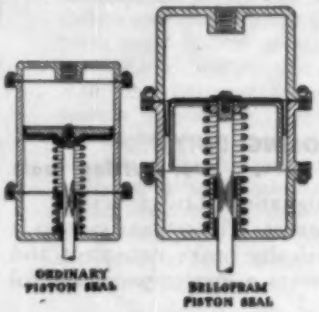
Circle 182 on Reader Service Card

NEW SEAL

. . . contributes to frictionless power

Designation: Bellofram

Features: Ordinary surface finishes, rough accuracy and hardness of surrounding parts are no longer factors in operation. The use of synthetic fabrics and elastomeric materials in construction permits high working pressures. Service merely con-



stitutes replacement of the seal and lubrication is not required. Freeze-up, friction losses and leakage are not problems. The seal itself is an efficient dielectric.

Specifications: They have exceptional cycle life, and can be made to operate at pressures ranging from ¼ in H_2O min. to 500 psig and over a wide tem-

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DAVENPORT, IOWA U.S.A.

perature range. The change in effective area is controlled by the surrounding accuracy of the mating parts.

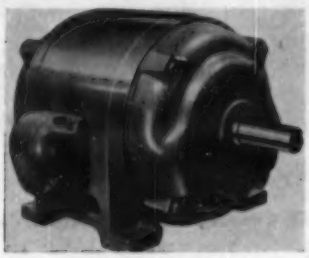
Applications: Responsive to small changes in pressure, the seals are adapted to precision instrument applications. The seals are frictionless, free positioning and relaxed at all points within their stroke. They give new freedom to designers and engineers of machinery and equipment which incorporates the conventional bellows or diaphragm principle.

Bellefram Corporation, Waltham, Mass.
Circle 183 on Reader Service Card

NEW MOTOR . . . has drip-proof design

Designation: Uniclosed, Type H

Design: The same standards in temperature rise, torque etc. are met as in the former type. Over-



load capacity has not been reduced. The slot design of the lamination has been improved and the asbestos-protected windings, have been reinforced and strengthened by the addition of Mylar laminations. Another desirable feature is the split dome, cast iron terminal box which makes the leads more accessible. Air impeller blades on the rotor ends have been redesigned with curved edges to permit more quiet operation. Lubriflush lubrication of the bearings provides means of replacing old grease with new without the necessity of disassembling the motor or disturbing the bearings.

Features: By utilizing the interior space to better advantage, the motor is built more compactly so that the same horsepower can be embodied in less space. The end brackets are of

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Literature available.

entirely new design with air intakes so arranged as to prevent intrusion of water, yet allow liberal air flow into the motor for 2-way ventilation.

U. S. Electrical Motors, Inc., Los Angeles 54, Cal.
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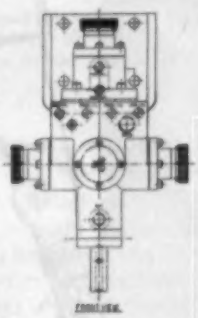
HYDRAULIC CONTROL VALVE . . . for contour machining

Designation: Trace-Master



Application: The unit incorporates pilot pressure valving and is extremely simple to adjust to close tolerance work. It has been designed for and is easily adaptable to vertical mills, spar mills, horizontal mills boring, mills, and other machine tools suitable to contour machining.

Hydraulic Research and Manufacturing Company, Burbank, Cal.
Circle 185 on Reader Service Card

VALVE COUPLING . . . for quick disconnect

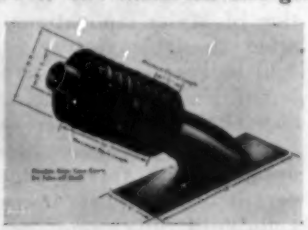
Designation: Quick-As-Wink
Sizes: ¼ in. to ¼ in. sizes with hose, or male or female pipe threads
Design: The jaws can not be

opened and the coupling can not be disconnected, while the sleeve is in this "on" position. Returning the sleeve to "off and exhaust" position traps the supply air in the sliding sleeve stopping its flow. It also opens ports through which air on the connection or tool side can be exhausted, thus preventing damage from air tools which are not properly exhausted. Danger is avoided, of the hose end whipping around discharging high pressure air to the atmosphere and permits the jaws to be opened so the coupling can be disconnected. A 90 degree twist of the brass sleeve, when it is in "off and exhaust" position, locks it in this position.
Construction: The nose piece of the jaw half of the coupling is provided with an "O" ring held in a machined groove. When the coupling is connected, the nose piece slides into the recess of the connection half of the coupling. The joint is tightly sealed by the internal fluid pressure acting on the "O" ring but the two halves are able to swivel freely without leakage. The "O" ring is readily accessible and can be replaced easily.

C. E. Hunt & Son, Inc. Salem, Ohio
Circle 186 on Reader Service Card

PLIABLE PROTECTION . . . operates thru 3 planes

Designation: Gortite
Design: Performs the dual function of dirt exclusion and gear



case lubricant retention. Protection is afforded for a 1¼ in. hex rod that has a 6 in. horizontal movement, 13/16 in. rise and fall and at the same time swings on 6 in. levers which are operating to 30 degrees either side of the vertical. Minimum close-down length, is obtained for the sleeve portion through controlled, convolution diameters.

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to all **Hydraulic Engineers!**

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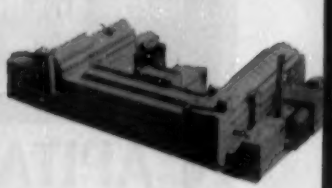
¾" Pilot Operated 4-Way Valve
Remotely Controlled
100-5,000 p. s. i.

This compact wide-range, Pantex Valve can be manifold or sub-plate mounted and is available in six different spool types to meet varying requirements. Other features include:

Hollow Spool Design— gives true open center, provides flow through hollow spool to tank port, with both cylinder ports blocked, when spool is centered.

Versatility of Pilot Control— can be easily adapted to hand, cam, or other directional control operation.

Low Leakage and Rugged Construction— designed for maximum duty cycles, this valve —like all Pantex valves—is precision tooled to close tolerances.



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Solenoid Controlled
100-5,000 p.s.i.

¾" Pilot Operated 4-Way Valve
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PAWTUCKET, RHODE ISLAND

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New Products

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Applications: Additional and ever expanding field requirements have influenced the manufacture in its development of various coatings and the application of water-tight zippers. One coating may be applied to a sleeve or part as an aid to vulcanizing the seams while another may add an element of flame-resistance to the over-all closure.

A & A Manufacturing Co., Milwaukee 3, Wis.

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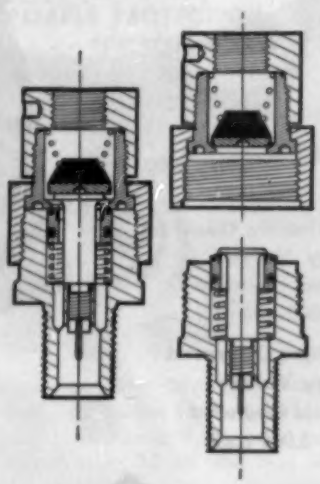
For more data use the Reader Service Card

SELF SEALING COUPLING . . . for leakproof pressure joints

Designation: Tractaline

Design: Provides a speedy and efficient method of making a pressure pipe joint which is leakproof. It is easily coupled or uncoupled by hand without loss of fluid or risk of an airlock.



The male half of the coupling embodies a simple and practical arrangement of a piston with two bonded rubber rings and a mushroom headed valve which when junction is effected, actu-

ates a conical valve in the female half. The piston and conical valve are spring loaded to obviate airlock when coupling and ensures a clean and quick cut-off during uncoupling.

Features: No tools are required to couple or uncouple the units, hand tightening of the eared nut being adequate to ensure a leak-proof joint. Ease of servicing is another feature. Separate half couplings can be supplied.

Applications: For working pressures up to 3000 psi and suitable for use with most fluids the range is comprehensive, all conventional sizes being included. Recommended for coupling the pressure lines of agricultural tractors to hydraulically operated farm implements.

Dowty Auto Units Ltd., Ashchurch, England
Circle 188 on Reader Service Card

SOLENOID OPERATED VALVE . . . is shock resistant

Designation: Series 6600

Sizes: Two basic valves can be used for five sizes, by merely

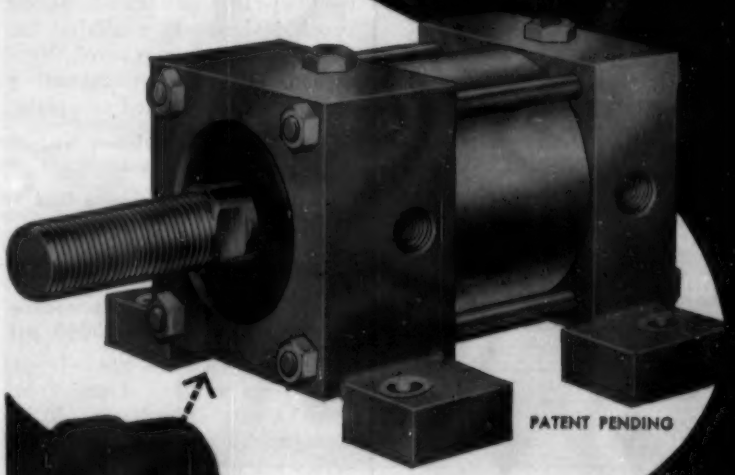
changing pipe tap size, the 1 in. valve may be used for ½, ¾ or 1 in. I.P.S. and the 1½ in valve for 1¼ and 1½ in.

Design: A new gasket mounted, solenoid operated, 4-way valve, that is fully shock resistant. Impact and shock are eliminated by the use on the valve spool of a scalloped design, which opens or closes gradually increasing or decreasing areas to the ports as the spool is moved left or right.

Features: Lower pressure drop and less back pressure are two additional features. Lower pressure is attained by designing larger, unrestricted passages, permitting a greater flow area. The ¾ in. size is rated at 28

SP

*APPROVED HEAVY-DUTY AIR CYLINDERS for Automation



QUICK-CHANGE PACKING CARTRIDGE Cuts Downtime

Step up production with rugged, service-free S-P Heavy-Duty Air Cylinders:

- Designed for 200 PSI
- Rolled steel end plates
- Extra long cushions
- Extra large, hardened piston rod
- Minimum mounting and envelope dimensions
- 5 types of mountings
- 8 bore sizes, 1½" to 6"
- Double packing
- Interchangeable check and cushion valves
- Quick-change packing and bearing cartridge

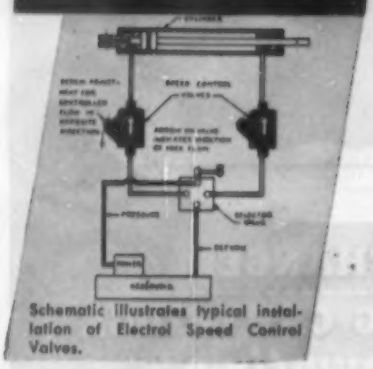
* S-P Automation Cylinders were designed expressly for a large automobile manufacturer. They are thoroughly proven for automation and general heavy-duty applications. Prompt deliveries. Send for Catalog 109. For S-P standard Air Cylinders, request Catalog 102. The S-P Manufacturing Corp., 12415 Euclid Ave., Cleveland 6, Ohio.

SP
THE S-P MFG. CORP. — Cleveland
A Bassett Company
PRECISION PRODUCTS SINCE 1916
AIR AND HYDRAULIC CYLINDERS • POWER CHUCKS • ROTATING AIR CYLINDERS
COLLET AND DRILL PRESS CHUCKS • AIR PISTONS, VALVES AND ACCESSORIES

Circle 107 on Reader Service Card

Electrol Speed Control Valves

Handle Air...Oil or Water with Operating Pressures up to 1,500 P.S.I.



Schematic illustrates typical installation of Electrol Speed Control Valves.

Electrol Speed Control Valves are designed to handle air . . . oil or water with operating pressures up to 1,500 P.S.I. They allow free flow in one direction and—by use of a metering device and check valve— accurately control reverse flow from 0 to valve maximum, even after thousands of cycles. They are available with ⅛", ¼", ⅜", ½" and ¾" N.P.T. ports. Your inquiries will receive prompt attention.

Better Designed Products Use Electrol Hydraulics

Electrol HYDRAULICS

KINGSTON, NEW YORK

Telephone, Kingston 1980

CYLINDERS • SELECTOR VALVES • FOLLOW-UP VALVES
CHECK VALVES • RELIEF VALVES • HAND PUMPS
POWERPAKS • LANDING GEAR OLEOS • SOLENOID
VALVES • ON-OFF VALVES • SERVO CYLINDERS • TRANSFER
VALVES • CUT-OUT VALVES • SPEED CONTROL VALVES

Circle 44 on Reader Service Card

New Products

Continued

gpm at 15 ft. per sec., which is a greater flow at less velocity than valves previously offered. Four standard models are offered—double solenoid, standard action; double solenoid, spring centered; single solenoid, spring return; and single solenoid, spring centered. Seven spool designs are available for 3-way and 4-way control. Furnished with gasket mounting only or with threaded sub-plate.

Rivett Lathe & Grinder, Inc., Boston, Mass.

Circle 189 on Reader Service Card

HYDRAULIC ACCUMULATOR . . . has operating pressure of 3000 psi

Sizes: Eleven sizes are offered. Bore sizes are 1½, 4 and 7 in. lengths vary from 9⅜ to 40 in. **Design:** All accumulators in the series are of single shell design. The shell is made from seamless steel tubing. The end caps are forged steel and internally threaded. The piston is aluminum. The seals are "O" rings. **Features:** A unique feature of

the accumulator is the use of alignment rings to support the piston. This arrangement results in low frictional wear and enables the "O" ring to perform its sealing function with an absolute minimum of leakage. The design provides a safety feature in the end cap which serves to warn of any trapped gas pressure in the accumulator when the cap is partially removed. **Specifications:** Oil volume capacities range from 10 to 1155 in. Operating pressure rating is 3000 psi.

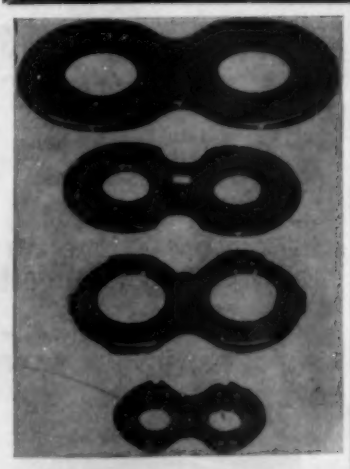
FOR A MONEY-BACK GUARANTEE OF LONGER SERVICE

specify

PROMET

The Engineered BRONZE

BEARINGS • BUSHINGS WEARING PARTS



Wear Plates—Promet #6

Sold only under a rigid guarantee of superior and satisfactory service or a refund of the purchase price upon return—the customer's opinion to be final.

Available in standard and special formulas developed to cope with specific or unusual conditions. Assure the best combination of physical properties, strength in tension and compression, hardness, and ability to sustain both static and dynamic loading.

Protect the shaft or other moving parts from injury, scoring, and seizing due to temporary interruption or failure of lubrication, and at the beginning and end of a run, when the speed of rotation is insufficient to maintain the oil film.

Will not powder under the most severe conditions of service. Available rough cast or machined to precisely controlled tolerances. They can be machined at surface speeds up to 875 lineal feet per minute.

Castings to your patterns—any size, shape or section—delivered as scheduled and specified. Pattern making, designing and machining when required.

Write today for free literature and service data sheets. Send blueprints, conditions of operation and other data for recommendations and quotations. You are invited to discuss your bearing problems with our metallurgists, engineers, and laboratory technicians.

THE AMERICAN CRUCIBLE PRODUCTS CO.

Bearing Specialists Since 1919

1303 Oberlin Avenue, Lorain, Ohio, U. S. A.

Circle 10 on Reader Service Card

Application: Furnishes power at extremely high oil flow for relatively short cycles of operation intermittently. The accumulator can function as, auxiliary source of energy in intermittent duty systems, as emergency source of fluid power for operation of a secondary hydraulic system, as a surge chamber or shock absorber, as a leakage compensator in a closed or pressure regulated circuit, as a thermal expansion compensator and as a dispenser of fluids under pressure.

The Parker Appliance Co.
Industrial Hydraulics Division,
Cleveland 12, Ohio

Circle 190 on Reader Service Card

HYDRAULIC FILTER
. . . for portable operation

Designation: Cuno Portable
Design: The standard design is equipped with a ½ hp motor

and a gear pump with a capacity of 4 gpm. The filter removes all particles down to 25 microns in size. Other features for special designs are centrifugal pumps, higher capacities and degrees of filtration of 10 and 50 microns. The filter is completely equipped with pump, motor, oil resistant hose, gauges and filter.
Applications: Originated from the demand of plant operators and maintenance men for a micronic filter unit that could be easily be moved from machine to machine. It filters such fluids as lube and hydraulic oils, cool-

Testing Anker-Holth Hydraulic Cylinder to be used on a metal stretch forming press. Cylinder on test is 16" bore, 69½" stroke, for 3000 psi operating pressure. Tested at 4500 psi.

Thorough testing of Anker-Holth Cylinders assures you dependable power

● Every Anker-Holth Cylinder... large and small... is tested at 150% of working pressure with the latest completely-filtered testing equipment. Anker-Holth testing facilities include portable units such as the one shown... also stationary equipment for pressures up to 10,000 psi.

This is one of many safeguards in manufacturing to assure you top performance and dependability in Anker-Holth Cylinders. There's a type and size of cylinder to match *your* need. Anker-Holth engineering know-how is available to help solve your power motion problems. Call or write ANKER-HOLTH DIVISION of The Wellman Engineering Co., Dept. C-10, 2723 Conner St., Port Huron, Michigan.

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ENGINEERED CYLINDER POWER
WELLMAN

Division of THE WELLMAN ENGINEERING COMPANY

Circle 14 on Reader Service Card

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ELASTOPLASTIC

PLUGS AND CAPS

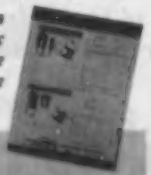
When you make an expensive part, it's good business to protect it against needless damage during shipment and storage. The way to do this – at minimum cost – is with S.S.White Elastoplastic Plugs and Caps.

These inexpensive flexible plastic closures are designed to cover or seal important openings or studs. They keep dirt and moisture out of interior parts –protect ends of tubing and studs – and seal in hydraulic fluids.

Besides being low in cost, S.S.White Elastoplastic Plugs and Caps are easily applied and removed – they're unaffected by oil, grease and gasoline and are available in a wide range of sizes for every need.

WRITE FOR BULLETIN P-5312

It has full details on S.S.White Elastoplastic Plugs and Caps. Sample plugs and caps can also be furnished on request.



THE S.S.White PLASTICS DIVISION
DENTAL MFG. CO.

Dept. L, 10 East 40th St. New York 16, N. Y.
Western District Office • Times Building, Long Beach, Calif.

New Products

Continued

ants and a wide range of heavy and thin industrial fluids. In addition there is a need to filter oils and other liquids transferring to and from storage.

Cuno Engineering Corp., Meriden, Conn.

Circle 191 on Reader Service Card

AIR COMPRESSORS
. . . for high pressure use

Designation: Model 303 (⅓ hp)
Model 202 (½ hp)

Design: The ⅓ hp model has a pressure range of 80-100 psi, the ½ hp model 90-120 psi. Both are available either as stationary units or equipped with rubber tired wheels and a handle for portability.

Applications: Specifically designed for heavy duty, high pressure use on the assembly line or on the farm. They are adaptable to many jobs from spraying paint or disinfectant to greasing, or inflating tires on heavy equipment. Both feature heavy gauge 11½ gal steel tanks equipped with safety valve, drain cock, pressure gauge and automatic pressure switch.

W. R. Brown Corp., Chicago 35, Illinois

Circle 192 on Reader Service Card

MEASURING DEVICES
. . . for accurate reading of pressures

Designation: Dynawheel

Size: Diaphragm diameters ¼, ½, 9/16, ¾ and 1 in.

KRAISSL

• Since 1926 • in the application, design and manufacture—pumps, separators, hydraulic accessories.

EQUIPMENT FOR FLUID POWER TRANSMISSION

Primary

Oil Pumps

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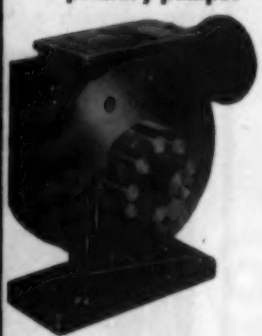
What's your problem?

- higher pumping speeds?
- tolerance of particle-laden liquids?
- peak suction for primary pumps?



the Kraissl-50 Roller Pump

Is unmatched for dependable performance on every one of those counts.

Bulletin A-1330 has full data . . . write for it. The roller-rotor design easily handles particles that would jam more tightly-fitted mechanisms—reduces cavitation, allowing higher speed operation*—develops high suction characteristics.

*Roller mechanisms permit higher speeds with any oil than most displacement designs.

KRAISSL KRAISSL CO

305 Williams Ave., Hackensack

Features: These pressure-sensing devices feature miniature size, high frequency response, high sensitivity and flush mounting of either threaded or flanged cases.

Specifications: Will handle pressure ranges as low as 0 to 1

psi, and as high as 0 to 3000 psi.

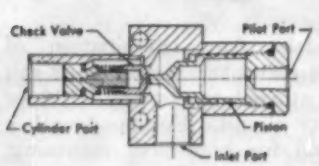
Application: For pressure measurement in the fields of aerodynamics, hydrodynamics, engine research, pressure control and ballistics. Pressure pickups can be mounted with their diaphragms flush to the surface of flow. This leaves the flow undisturbed and eliminates pressure-connecting tubes and their phase shifts. Miniature size allows pickups to be located in otherwise inaccessible places and to be spaced closely for pressure differential measurements.

Dynamic Instrument Company, Inc., Cambridge, Mass.

Circle 193 on Reader Service Card

PILOT CHECK VALVE
. . . locks circuit without leakage

Design: Includes a full size check valve and a piston to lift



the check from its seat when reverse flow is desired. It permits flow from the inlet port through the check to the cyl-

Now, cost-conscious engineers are standardizing on **DARCOVA PUMCUPS!**

Reason—On all types of air and hydraulic controls and mechanisms maximum volumetric efficiency is assured with Darcova Pumcups. Moreover, Pumcups outlast ordinary packing at least 3 to 1!

CHECK THESE OTHER ADVANTAGES TOO!

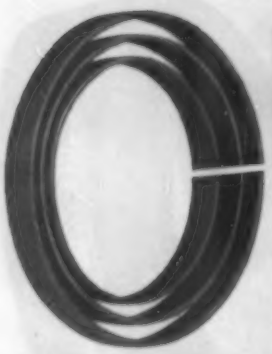
- Reduced operating speeds
- Fewer shutdowns
- Smoother operation
- Lower power costs
- Longer cylinder life
- Closer control

If your slippage is showing, write for Bulletin No. 4502 on Darcova Pumcups for air and hydraulic mechanisms . . . or Bulletin No. 4401 on Pumcups for reciprocating pumps.

DARLING VALVE & MANUFACTURING CO.
Williamsport 15, Pa.

DARCOVA
THE ORIGINAL COMPOSITION CUP
PUMCUPS

Circle 16 on Reader Service Card



The AUTO-DIESEL *Long Wearing* GUIDE RINGS ★

The new Auto-Diesel Guide Rings have been especially developed for use in single acting hydraulic cylinders. They are made of long wearing bronze material to give you long and useful service. They are from 2" up to and including 10" in diameter and in width from ¼" to 1½". These rings are priced right—we suggest that you investigate.

WANT QUALITY PISTON RINGS *in Small Quantities* IN A BIG HURRY?

It will pay to write ★ AUTO-DIESEL

We know from experience how very important it is to obtain piston rings when they are needed. Costly production delays often result for lack of the right piston rings. We specialize in making piston rings in small quantities and in a big hurry. On top of that they are attractively priced. We can supply rings up to 35" diameter for original equipment and for replacement in compressors, hydraulic cylinders, valves, etc. Write for prices.

Write for Details

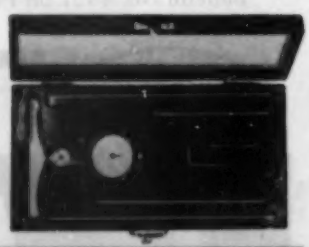
THE AUTO-DIESEL PISTON RING CO.
3137 Superior Avenue • Cleveland 14, Ohio
"RINGS and SHAPES Since 1921"

Write for Catalog 33B

Reliant

ADJUSTABLE **depth** and groove location **GAGE**

- Fully adjustable from 0" to 6¾" without changing rods.
- Positive and accurate inspection of depths of holes, slots, shoulders and recesses.
- Light and easy to operate.



Reliant Industries
4947 Firestone Boulevard
SOUTHGATE, CALIFORNIA

ALSO MANUFACTURERS OF PRECISION GAGES FOR CHECKING GROOVE DIMENSIONS FOR "O" RINGS AND SNAP RINGS

New Products

Continued

inder port and blocks reverse flow until pressure is applied at the pilot port. When pressure is applied at the pilot port and little or no pressure exists at the inlet port, the piston unseats the check and allows reverse flow through the valve. The piston has an area four times the area of the check valve seat. This ratio of areas reduces the pressure required at the pilot port to unseat the check and insures that unseating will occur even when locking pressure exceeds the relief pressure setting of the system. These valves are furnished with leakproof copper brazed steel bodies with burst pressures in excess of 10,000 psi. Designed for 3000 psi oil service.

Application: These valves are designed to lock a cylinder or part of a circuit, without leakage and are extensively used on hydraulic clamping devices where slight leakage would cause loss of clamping pressure.

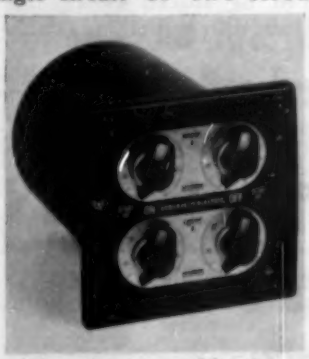
Fluid Controls, Inc.,
Mentor, Ohio

Circle 194 on Reader Service Card

PROCESS TIMER
. . . for time delay operation

Designation: G-E Type TSA-18

Design: Timer is available in single-circuit or two-circuit



models. Any combination of single and two-circuit units can be utilized to control 3,4,10 or more circuits. Equipped with a bevel for semi-flush mounting, the timer requires a minimum of mounting facilities.

Features: Include extra heavy nylon gears, over-all construction of almost 100 percent pure

zinc alloys and a dust resistant cover. New semi-flush mounting on the face of the timers reduces size.

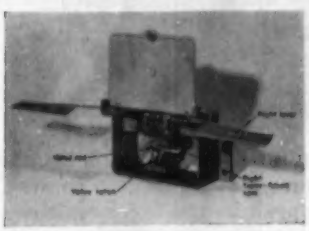
Specifications: It operates on a power supply of 60,50 or 25 cycles, with a contact rating of 10 amps at 120 volts or 5 amps at 240 volts.

Applications: A line of process timers for providing accurate, adjustable time-delay opening and closing of electric contacts. The timers can control such process equipment as hydraulic presses, tire molds, carpet dryers, baking equipment, heat-treating ovens, sirens, mixing machines, signals, conveyors, photographic equipment and others.

General Electric Company, Schenectady 5, New York
Circle 195 on Reader Service Card

PNEUMATIC CONTROL ... has two lever coordination

Design: The mechanism consists of an air valve and two extending levers, all inter-connected through linkage which



permits valve action only when both levers are operated. For convenient adaption to any type of equipment, the control unit is equipped with two air inlets and two air outlets. The outlets are fixed at 180 degrees and the double ended inlet is adjustable through a full 360 degree.

Specification: Length of the control, levers included, is 23½ in. The housing is 10⅝ in. long, 6¼ in. high, 5½ in. deep. It is designed for a maximum air pressure of 125 psig.

Application: Developed from a two-hand safety control, which insures that press operators keep both hands in safe locations during press closure, the new product offers many new possibilities in the automatic control of pneumatically and mechanically powered equip-

your leather packings are only as good as the leather they're made from

That's why Rhoads Packings are made from premium Tannate leather. Tannate is a special tanned leather, developed for industrial applications exclusively. It's a flexible leather, which means it can be formed with a minimum of strain, and yet retain a higher proportion of the leather's natural strength. Because of this extra strength Tannate will withstand the highest pressures to which any packing can be subjected with a minimum of cold flow or extrusion. Tannate leather is a non-abrasive material, therefore these packings will not score or abrade cylinder walls or pistons. Impregnated to meet your requirements, Tannate leather packings become adaptable to a wide range of operating conditions . . . they can be made hard as rock or soft and flexible.

Tannate packings are precision molded and finished to provide an effective seal against glycerin, alcohol, mineral, fish and animal oils . . . water, vegetable or any other non-caustic, non-acid fluid. For more specific information write J. E. Rhoads and Sons, 35 North 6th Street, Phila. 6, Pa.

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INDUSTRIAL LEATHERS
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Circle 104 on Reader Service Card

SOLVED...

The Problem of Driving the Pump from a Reversing Shaft without Changing Direction of Flow or Port Positions

New Tuthill Catalog No. 105 Provides the Facts You Need on Automatic Reversing Pumps

How to lubricate reversing machinery! How to provide coolant or hydraulic power when the pump must be driven from a reversing shaft! How to insure pump flow in the proper direction on machinery which must be shipped without knowing the ultimate direction of the driving members!

The answers to questions like these are presented in this new Catalog No. 105 on Tuthill Automatic Reversing Pumps. Through a unique feature developed by Tuthill, these pumps can be driven in either direction of rotation without changing direction of flow or port positions. The wide range of types, sizes, and pressures makes these pumps readily adaptable to your requirements. Capacities up to 200 g.p.m. and pressures to 400 p.s.i.

Write for your copy of Catalog No. 105 today

TUTHILL PUMP COMPANY

Dependable Rotary Pumps since 1927

939 East 95th. St., Chicago 19, Ill.

Canadian Affiliate: Ingersoll Machine & Tool Co., Ltd. Ingersoll, Ontario, Canada

New Products

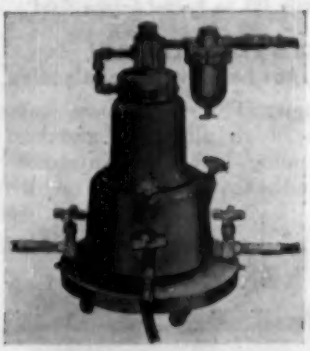
Continued

ment. It can be adapted to a machine to prevent operation until two necessary conditions are fulfilled and to prescribe operator's position or position of his hands or feet, before equipment functions, to interlock control circuits, to control inspection, mechanical handling or safety systems by dual circumstances.

Pentex Manufacturing Corp., Pawtucket, R. I.
Circle 196 on Reader Service Card

HYDRAULIC PUMP
. . . has push button operation

Designation: Air-O-Matic



Features: Pressure is delivered to rams for push-button control. The push-button is conveniently located on top of the pump allowing easy control by foot or knee when both hands are used in making ram setups. The pump delivers over 10,000 psi at 80 lbs. air pressure. It eliminates slow, leaky hand pumps. Uses up to 4 rams on the same hook up, each ram individually controlled. The pump operates hydraulic rams and cylinders from 1 to 100 tons. Mounted on bearing casters, it is easily portable.

Bee-Line Company, Davenport, Iowa
Circle 197 on Reader Service Card

RUBBER BONDED
. . . to nylon bearing

Feature: The process replaces a former technique whereby metal sleeves were molded into the rubber, an oilite bearing was inserted and the rubber surfaces

were ground to dimensions. Using this method, the injection

molding and bonding within close tolerances are done in one operation.

Minnesota Rubber and Gasket Co., Minneapolis 16, Minn.
Circle 199 on Reader Service Card

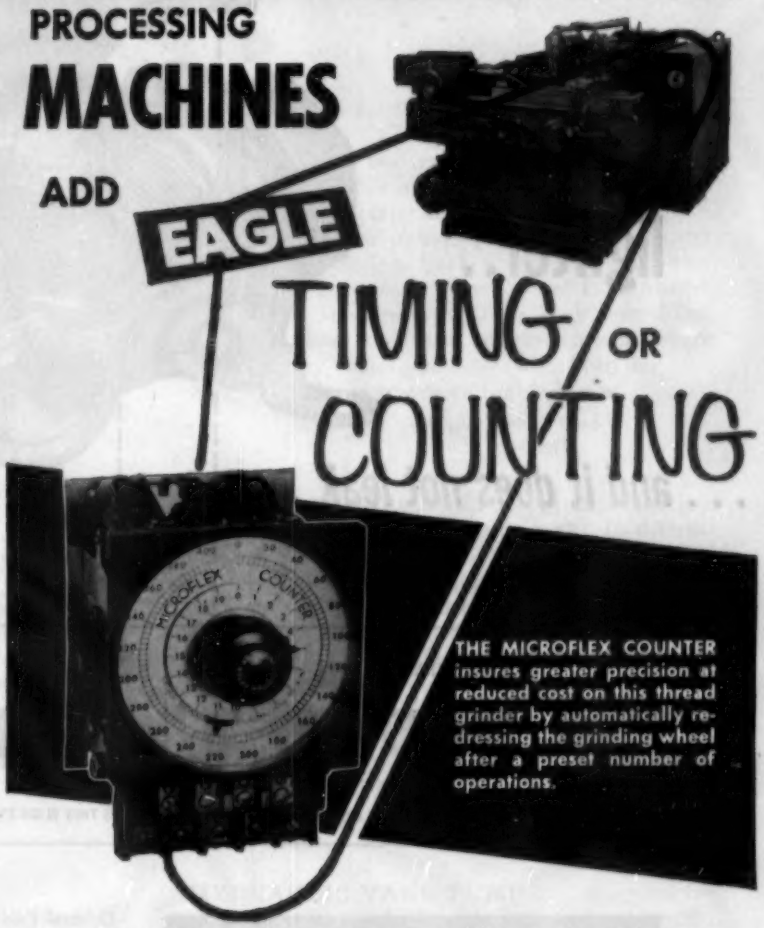
HYDRAULIC BOOST PUMP . . . delivers 30,000 psi

Designation: Model 10-302
Design: Design and construction of the unit permits either oil or water to be used for testing or powering. Models presently available have pressure outputs ranging from 0 to 30,000 psi, when operating on 80 psi maximum air pressure. Both discharge and volume of fluid

can be easily and accurately controlled by an air pressure regulator installed in the air supply line. Fluid output capacities range from 2½ gpm at 1000 psi to 8 cu. in. per minute at 30,000 psi.
Operation: The pump operates on the principle of differential areas. A large air driven piston is used to drive a smaller fluid piston, which in turn delivers a fluid volume at high pressure.

Southern California Hydraulic Engineering Corp., Los Angeles, Cal.
Circle 200 on Reader Service Card

AUTOMATION . . .
IF YOU MANUFACTURE
PROCESSING
MACHINES
ADD
EAGLE
TIMING OR COUNTING



THE MICROFLEX COUNTER insures greater precision at reduced cost on this thread grinder by automatically redressing the grinding wheel after a preset number of operations.

The Microflex Counter is not a totalizing instrument. It automatically operates contacts after a preset number of electrical impulses and is spring reset. Modernize your machines for greater efficiency with EAGLE Timers and Counters. Eagle sales engineers will assist you without obligation. Write today for literature or send us your control problems.

Industrial Timers by EAGLE

EAGLE SIGNAL CORPORATION
MOLINE, ILL.

Circle 39 on Reader Service Card

smaller..

lighter..

. . . and it does not leak

General Controls

AV-14

hi-g electro-hydraulic selector valves

General Controls AV-14 Series electrohydraulic selector valves guarantee positive control of high-pressure and high flow hydraulic systems. The pilot valve, balanced by opposing continuous duty solenoids, positions the selector valve by directing fluid to one end of the slide and returning it at the other. This double balance permits maximum efficient control with minimum current drain. Compact and light weight, with specially hardened and optically ground sealing surfaces that approach "zero" leakage. General Controls Hi-g selector valves provide leakproof control of all fluids at pressures ranging from 150 to 3000 psi. For complete information on the AV-14 Series, the AV-16 Gate Valve Series and Hi-g Limit Controls, send for your copy of Catalog 53A today.

GENERAL CONTROLS

Glendale, California • Skokie, Illinois

Manufacturers of Automatic Pressure, Temperature, Level and Flow Controls for Heating, Home Appliances, Refrigeration, Industrial and Aircraft Applications.

FACTORY BRANCHES IN 35 PRINCIPAL CITIES

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USEFUL LITERATURE

You'll find many valuable production and design ideas in publications described here . . . copies will be sent you free without obligation

Continued from page 44

EXPLOSION-PROOF SWITCHES . . . are described in data sheet 84 released by Micro, a Division of Minneapolis-Honeywell Regulator Company. The switches are designed for use as limits, safeties and interlocks in explosive atmospheres. Many types are illustrated and complete information is given for each type. The dimensions are given for each basic type, together with characteristics and ratings. Operating force, release force, pretravel, overtravel and differential travel are also given. Each of the switches make use of the same size cast housing. The same roller levers are used on all "AR" switches and a uniform plunger assembly is common to all "Q" types.

Circle 218 on Reader Service Card

SOLENOID VALVES . . . which are automatic, feature less danger of clogging, operate under differential pressures up to 150 psi and temperatures to 400 F, are covered in a folder released by The Johnson Corp. These valves are available for either normally closed or normally open service, with stainless steel valve and seat. Sizes range from ½ to 3 in. Other products of interest are also included in the folder.

Circle 219 on Reader Service Card

FLEXIBLE COUPLINGS . . . to meet every power transmission requirement are covered in literature Form No. 1009, released by Lovejoy Flexible Coupling Co. The couplings include a wide range of types and sizes to fit all standard applications. In addition, couplings of modified or special design, for example, are available for applications requiring extreme compactness. A cross section view of each coupling shows the construction and how they work. Complete dimensions and pertinent data for each type coupling is given. Maximum bore sizes for the heavy duty type range from 2⅜ in to 9½ in. Rated at 100 rpm, they range from 3.72 to 810 hp.

Circle 220 on Reader Service Card

HYDRAULIC HOSE ASSEMBLIES . . . and couplings are covered in catalog No. 8000, released by Champ Industries, Division of Hose Accessories Co. The literature consists of 12 pages and is in two colors. The product line is complete. In addition to male and female hose ends for all standard hose sizes, straight unions, 90 degree adapter unions and 45 degree adapter unions are included. Each product type is illustrated with an outline drawing and is identified. Each of the size hose couplings, hose assemblies, adapter unions and tube adapters available are cataloged by series, then by size, both for two wire braided and one wire braided hose.

Circle 221 on Reader Service Card

AIRCRAFT FASTENERS . . . Aircraft Fastener Division, Scovill Manufacturing Co. is distributing a combination catalog and engineer's manual. A 58 page booklet, in addition to giving information on the fasteners, presents detailed engineering data on performance, installations and special applications. Designed to hold together two over lapping metal sheets under conditions of tension, shear and vibration in fact, any place where panels, injection plates, ductwork etc. must be held secure and still be readily removed and put back.

Circle 222 on Reader Service Card

HYDRAULIC VANE PUMP . . . designed for maximum oil intake to rotor vanes is presented in a very complete bulletin released by Gresen Mfg. Co. A few of the many features described are; pump is fully balanced, 4 position inlet, optional size port opening and self reversing. A chart shows the delivery gpm for each model at various psi and rpm ratings. Dimensions of the pump are shown and typical installations are suggested. Other products illustrated and described are a control valve, a selector valve, float position valve and a differential relief valve.

Circle 223 on Reader Service Card

ELECTRIC TIMING MOTORS . . . for every timing requirement are described in catalog No. 322, offered by Haydon Manufacturing Co. Inc., subsidiary of General Time Corp. The contents of the catalog cover each of the motor series avail-

Quick-As-Wink
AIR AND HYDRAULIC
Control Valves

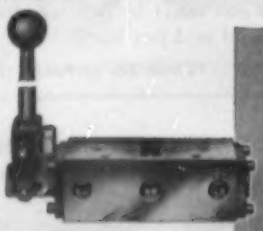
FEATURE THIS MONTH

1/8" and 1/4" Single Solenoid Valves

They'll give you up to 300 cycles a minute
For air to 125 psi—vacuum—
or low pressure hydraulic service

● These valves combine the utmost simplicity in design with rugged construction. They will give you millions of cycles of highly satisfactory, efficient, trouble-free service. Small solenoid, with short stroke operates the valve plunger, eliminating levers, links and pins. Low amperage requirement eliminates intermediate relays and simplifies electrical control circuits. Side or bottom pipe connections. Valve body and solenoid are both mounted on an aluminum base and can be removed independently without disturbing the piping. 2, 3, 4 and 5-way actions. *Write for full details today!*

also the following

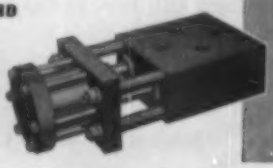


LEVER OPERATED SINGLE PLUNGER VALVES

Two position and three position valves, 3/8" to 1 1/2" sizes; 2-way, 3-way and 4-way actions. Widely used for controlling the operation of single and double acting cylinders or as pilots for operating other valves.

PILOT CYLINDER OPERATED HYDRAULIC VALVES

Two position valves, 1/2" to 4" sizes, for line pressures from 1000 to 5000 psi. Valve is placed close to the work and operated from a central control point with an easy to handle air valve avoiding operator fatigue.



For Fully Descriptive Data Sheets Write

C. B. HUNT & SON, Inc.

Hand, Foot, Lever, Cam, Pilot, Diaphragm and Solenoid Control Valves

1991 EAST PERSHING STREET • SALEM, OHIO

Circle 63 on Reader Service Card

USEFUL LITERATURE

able and a very complete resume of the specifications, features and design. There are timing motors for a standard duty, wide range; standard duty, slow speed; heavy duty, slow speed; and direct current motors. The motors are small in size, totally enclosed and will operate in any position. Standard speeds are from 1 second to one hour per revolution. Catalog No. 323 covers timing devices and No. 324, clock movements.

Circle 224 on Reader Service Card

QUAD RING . . . a four lipped rubber seal that resists spiral twist is described in literature issued by Minnesota Rubber and Gasket Co. The literature treats, in detail, applications, engineering features and characteristics of the ring, shows cross section drawings under various pressures and compares this in chart form with rubber "O" rings. Also shown are cross sections of a typical installation and complete listings of all available sizes.

Circle 225 on Reader Service Card

METAL CHAINS . . . and user benefits are described in a new Bulletin No. 53-56, released by Chain Belt Company. A pictorial presentation of available chains is included. The chains are

NEED SPECIAL

SMALL BORE
AIR OR HYDRAULIC
CYLINDERS

Here's An EXAMPLE!

- **BORE** ..... 0.625"
- **STROKE** ..... 0.400"
- **PRESSURE** ..... 2000 PSI

The cylinder illustrated was designed and furnished for Aircraft armament actuation where precision bore and stroke dimensions are mandatory.

We are specialists in the manufacture of small bore cylinders —to specifications. You are invited to submit your requirements. Prompt quotations and drawings will be submitted.

ASK FOR BULLETIN 300

THE AIROYAL CO.

SUCCESSORS TO COMPRESSED AIR PRODUCTS
6 CHURCH ST. NEW YORK 6, NEW YORK

Circle 6 on Reader Service Card

designed to resist corrosion and abrasion; the metal is harder than malleable iron, unusually ductile and machinable. Illustrated with many photos showing unusual applications. A chart shows the average comparative mechanical properties of the metal used in the chains vs other common metals. Relative corrosion resistance is also presented in chart form.

Circle 226 on Reader Service Card

REVOLVING JOINTS . . . for rotating air, hydraulic and steam tables; cylinders; brakes and clutches are described, in literature available from Rotherm Engineering Company, Inc. Photos of a few types shows the style and construction of the units. They are designed for hydraulic pressures to 1500 psi single or double passage for air and hydraulic cylinders. Cross-section views shows the arrangement of the feed lines. Instructions are also included, for mounting different styles of the revolving joints.

Circle 227 on Reader Service Card

SPECIAL VALVES . . . for fuels, synthetic oils, gases and liquids, for low and high temperatures is described in literature released by The Mathewson Corp. It is explained that this specialized service is set up to relieve engineering departments of time consuming new design criteria. Facilities and staff experience are particularly suited to production and design of line check valves, swing check valves, vent valves, low pressure and regulator relief valves.

Circle 228 on Reader Service Card

"MOISTURE CONTROL IN COMPRESSED AIR" . . . is the title of a new 4 page brochure offered by Van Products Co. Types and quantities and methods for the removal of the moisture is discussed. The subject material is quite technical but the information as presented is easy to read and to understand. The dehumidifier-filter method, units, and dessicant are described along with results which can be anticipated with this unit. The method for providing clear, dry air for use in industrial and commercial applications is given. The process used, treats compressed air with a specially formulated drying agent. This agent is non-corrosive.

Circle 229 on Reader Service Card

HYDRAULIC CYLINDERS . . . A complete description of the series "J" hydraulic cylinders is given in a new 8 page, 2 color catalog 53, issued by the Hydro-Line Mfg. Co. Illustrated is a detailed drawing with captions pointing out outstanding performance features. Also shown are

Why Minnesota Rubber parts have longer life

Actual use in many of the finest air, gas and hydraulic systems proves Minnesota Rubber O-rings and rubber parts last longer. Made by Minnesota Rubber's exclusive injection molding process, all parts have extremely high density, tolerances within ±.001 inch, no flash on sealing surfaces—and may be bonded to metals. Result: longer flexing life at a cost lower than the industry average!

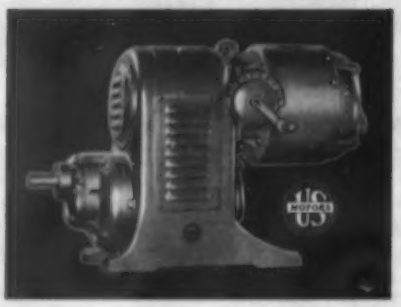
Now *anyone* can find better rubber parts—if he remembers the name *Minnesota Rubber*. Write today for information and prices. For complete O-ring installation data, request the new free catalog 9-B.

Minnesota Rubber and Gasket Company

3630 Wooddale Avenue, Minneapolis 16, Minnesota, Dept. 307, Phone MOhawk 9-6781

Circle 83 on Reader Service Card

THOUSANDS OF PLANTS NOW GETTING THOUSANDS OF SPEEDS



Miracle Motor

ANY RPM BY DIAL CONTROL

Get more production out of your present machines by powering them with U. S. Varidrive motors. No extra space required. Thousands of plants are profiting with this miracle motor. Turning a simple control handle changes speed of the Varidrive to any desired r.p.m. in ratios up to 10:1. Operators can instantly select the speed best suited for the work.

ALL-IN-ONE PACKAGE

Occupies little more space than a single speed motor. ¼ to 50 hp, 2 to 10,000 r.p.m.

U.S. VARIDRIVE

Mail Coupon for 16-pg. Booklet

REQUEST FOR VARIDRIVE BOOKLET

U. S. ELECTRICAL MOTORS Inc. AM-4
Box 2038, Los Angeles 54, Calif. or Milford, Conn.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE___ STATE_____

Useful Literature

detailed drawings of various mountings, along with tables of bore sizes, rod, body and mounting dimensions. Along with basic engineering data, are the minimum body dimensions of the cylinder. To these dimensions can be added virtually any shape of mounting to meet a specific application.

Circle 230 on Reader Service Card

VIBRATION ISOLATOR . . .for light industrial applications is presented in Bulletin 537, available from The Barry Corp. Included is data on dimensions, load ratings, installation procedure, variation of natural frequency with load and percent efficiency of isolation. The design of the isolator controls, vibration and noise caused by motors or motor-driven equipment. The folder presents the series which are available and the features and characteristics of each.

Circle 231 on Reader Service Card

SERVO PUMP UNITS . . . and their application in hydraulic transmissions are described in a brochure SE-15 released by Vickers, Inc. An electro-hydraulic servo pump unit is essentially an electrically-controlled variable delivery, positive displacement, hydraulic pump. The combina-

COMPRESSED AIR AND GAS COME OUT OF THE LOGAN

ARIDIFIER

Scrubbed CLEAN AND DRY

INSTALL ARIDIFIERS ON LINES SERVING

- Paint Spray Guns
- Air Tools
- Air Hoists
- Foundry Jolting Machines
- Sand Blasting Tools
- Sand Blasting Rooms
- Metal Spray Guns . . . or Wherever the line must deliver clean, dry air or gas

On any air or gas line 92% of the dirt, oil, scale and water that enter the Aridifier is trapped and removed from circulation. The Aridifier's patented centrifugal-baffle action scrubs air and gas clean and dry . . . protects equipment, prevents freezing, fouling, corrosion and caking, produces best results with spray gun and air tool operations, etc. Easy to install. Self cleaning. Maintains itself. 10 models available. Capacity 7 CFM to 17,000 CFM.

Learn HOW the Aridifier scrubs with a patented centrifugal-baffle action.

Write for This Catalog Now!

Logan ENGINEERING CO.

4920 W. Lawrence Ave., Chicago 30, Ill.

Circle 125 on Reader Service Card

Circle 78 on Reader Service Card

tion of this pump and a rotary or linear hydraulic motor forms an electrically controlled hydraulic transmission. A typical pump and motor are illustrated. The pump contains a conventional piston type pumping unit and two gear pumps. The direction and rate of fluid flow from the pump unit is controlled by the application of a small electrical signal. Speed changes are smooth and stepless. Complete information is given on the servo pump units together with technical data and charts.

Circle 232 on Reader Service Card

ROTARY PUMP . . . with pressures up to 3000 psi; and with running speeds from 20 to 1800 rpm by direct couple to an electric motor is described in a folder released by Davies Brothers. Some of the features of the Savery pump includes positive action at slowest speeds, delivery characteristics unaffected by variation in viscosity, feed or back pressure, no idle pockets or passages, and no aeration or agitation of the fluid. Complete data is given on both the fixed delivery type and the variable delivery type. Some of the applications suggested are hydraulic feed in machine tools, lifting gear in mechanical handling, hydraulic equipment in aircraft and pressure lubrication. A cross sectional view shows the construction of the unit.

Circle 233 on Reader Service Card

SPEEDY AIR VISE

SPEEDS UP

✓ MILLING ✓ PUNCHING
✓ DRILLING ✓ BENDING
✓ TAPPING ✓ RIVETING

GRIPPING FORCE 15 TIMES AIR LINE PRESSURE

Speedy Air Vise helps you do dozens of operations faster, better, cheaper—by air pressure! Foot control valve opens and shuts vise instantly, leaving *both* hands free to produce *more!* Jaw opens up to 3 inches, holds castings, parts, jigs, etc. Compact and trouble-free.

*Complete with Foot Control, Air Hose and Fittings.....*only **$36.00**

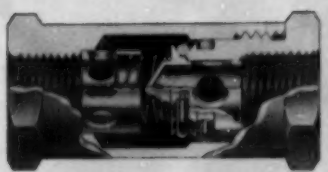
Prompt Delivery from Your Supplier or Write Direct

W. E. BROWN CORPORATION • 2635 N. Normandy Ave. • Chicago 35, Ill.

AIR REGULATORS • AIR FILTERS • AIR GUNS • PORTABLE COMPRESSORS

Did you ever stop to think

Check valves are important! be sure- with Circle Seal!



CIRCLE SEAL CHECK VALVE

—the valve that is guaranteed not to leak

If you use check valves or if your product design incorporates check valves, remember —a check valve that doesn't do its job costs you or your customer lost time or money. Valve leakage may result in a petty annoyance or a major catastrophe. Excessive wear results in high maintenance costs. This trouble may easily be avoided by the use of Circle Seal precision check valves. So for positive control of liquids or gases, take no chances, be sure by specifying Circle Seal.

Here's what Circle Seal Principle offers you:

TYPES

Check
Relief
Vent & Breather
Excess Flow
Manual Release

FEATURES:

- Perfect sealing at all back pressures.
- Quiet, chatter-free operation.
- Low pressure drop.
- Quick opening—positive closing.
- Amazing service life.

If you use check valves, ask us to have our representative call on you.

CIRCLE SEAL *precision valves*

JAMES•POND•CLARK

2181 East Foothill Blvd • Pasadena 8, California

Representatives in Principal Cities.

POINT WITH PRIDE

to the pump on your hydraulically-operated product

. . . a Brown & Sharpe Rotary Geared Pump No. 53 or 55

with

- helical gears
- antifriction bearings
- free turning mechanical seal

You can point with pride to the quiet-operating pump that gives smooth flow and long service when you equip your machines with Brown & Sharpe Rotary Geared Pumps. They deliver large volumes of oil at high speeds and under pressures up to 200 psi with a smoothness and quiet made possible by helical gears operating on antifriction bearings. The No. 53 pump supplies up to 23 gpm; the No. 55 up to 34 gpm.

Write for the illustrated Brown & Sharpe Catalog describing 185 stock pumps. Brown & Sharpe Mfg. Co., Providence 1, R. I.

BUY THROUGH YOUR LOCAL DISTRIBUTOR

B·S

Brown & Sharpe

USEFUL LITERATURE

Continued

PRECISION INSTRUMENTS . . . manufactured by the Chicago Dial Indicator Co., are presented for the first time in a complete general catalog 106. The catalog consists of 16 pages, well illustrated in color. Some of the instruments cataloged are dial indicators, dial indicator test sets, bench center set, test sets with magnetic base, regular test sets, bench gage, dial snap gages and depth gages. Featured with the dial indicators is the new continuous reading dial for .001 in, .0005 in and .0001 in graduations.

Circle 236 on Reader Service Card

VALVES AND GAUGE COCKS . . . Bulletins 3502 and 3503 describe valves, and bulletin 3502-A describes the gauge cocks. These are released by Grove Regulator Company. Triport valves for meter manifolds, gauge lines, blowdown and many other services use resilient "O" rings to provide bubble tight shutoff of flow in either direction. The hand wheel is threaded to outside of integral bonnet, providing maximum non-fouling bearing surface. A safety stop prevents stem from being forced out by excess pressures. A cross sectional view shows the construction and each part is labeled showing the features. Gauge cocks,

LARGE PROCESSOR CHOOSES

Nicholson Valves for LONG WEAR

Nicholson cylinder control valves recently completed 10 years of constant use, without servicing, on an operation which had "proved too much for other tested units." This report, from a large rubber firm, again confirms the fact that Nicholson valves, with their specially treated hard seats and non-corrosive lapping flat discs, become tighter with use. Nicholson furnishes valves for cylinder control, distributing and metering service, and for many special operating cycles. For air, gas, oil, steam, water.

Foot models (right), ¼" to 1½"; press. to 300 lbs.

Solenoid (left) and motor types, ⅛" to 2½"; press. to 375 lbs. Lever models (right), ¼" to 2½"; press. to 5000 lbs.

CATALOG 552

213 Oregon St., Wilkes-Barre, Pa.

W. H. NICHOLSON & CO.

TRAPS · VALVES · FLOATS

Circle 22 on Reader Service Card

Circle 90 on Reader Service Card

another product by Grove, is used for gauge lines, blowdown and other services. General specifications are ½ in, 10,000 psi. They likewise use "O" ring seals to provide bubble tight shut off of flow in either direction. Here also, all of the parts are shown in section and labeled with their name and features.

Circle 237 on Reader Service Card

TUBE FITTINGS . . . socket type for permanently welded joints are presented in catalog 4370 issued by The Parker Appliance Company. The following fittings are cataloged as to size: adapters, connectors, unions, elbows, tees and crosses. These fittings are for applications involving extreme temperature conditions or wherever permanently welded tubing circuit joints are required. A tapered socket aligns and holds the tube for welding operation. A tapered socket prohibits extraneous material from entering flow passage during the welding operation, thus forming obstruction.

Circle 238 on Reader Service Card

PRESSURE POTENTIOMETER . . . is a sensitive pressure pick-up actuated by a miniature bourdon tube. The movement of the tube, in response to pressure changes, is transmitted to the moving contact of the precision wire wound po-

Cover Band Holds **Spring** automatically in place preventing ring from opening up Here

Stops Build Up of Ice, Mud or other Foreign Bodies between Rod and Ring . . .

The wiper edge of the FALL Wiper Ring is TIGHT against the piston rod at all times REGARDLESS OF WEAR. Spring-Loaded, it gives wiper edge a squeeze grip action . . . the squeeze grip is always the same because of the uniform tension of the spring under the endless cover band.

Squeeze Grip Action Does It—*patented*

Ice, grit and other foreign bodies do NOT Build Up under ring. Rod does not stick or become immobile in ANY temperature . . . the FALL ring has complete contact on rod ALL WAYS, always.

Inslot on FALL Wiper rings. Available from ½" to 13" dia. Military part numbers from AN6231A1 to AN6231A71. Write, wire or phone us your wiper needs.

Used During World War 2 and ever since by the Military.

Fall Wiper Rings Spec MIL-S-5849 are AN approved.

Covered by patents issued and patents pending.

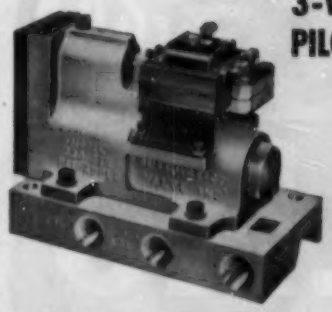
Ace Products Co., Toledo 1, Ohio
Phone ADams 6813

Ask About FALL Wiper Rings with Closed Joint
Especially designed for those applications where absolute freedom from dirt passing through joint of ring is required.

Fall Wiper Ring SPRING LOADED

Fast-Rugged-Dependable

AV AIR CONTROL VALVES



3-WAY..4-WAY PILOT OPERATED VALVES

Short operating stroke gives exceptionally high speed performance.

Uses small, low-power, nationally-known solenoids.

Small, compact, made with non-corrosive materials. 3-way (norm. open or closed) and 4-way operation full port sizes ¼", ⅜", ½" and ¾".

3-WAY... 4-WAY SOLENOID OPERATED PILOT VALVES

Direct acting—¼" pipe tap for pressures to 150 P.S.I.

Light aluminum construction.

Operates master valves, or small cylinders up to 3" in diameter.

SPEED CONTROL VALVE

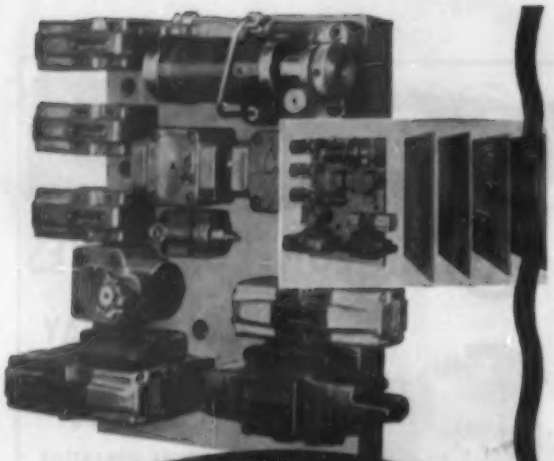
Efficiently controls speed of piston rod of cylinder. Restricts air being exhausted from cylinder.

Used on air or hydraulics —pressures to 1200 P.S.I.

Sizes ¼", ⅜" ½" and ¾".

Write for bulletin and attractive O.E.M. and quantity discounts

AUTOMATIC VALVE CO.
37419 Grand River Ave.
FARMINGTON, MICHIGAN



ALMO

HYDRAULIC
CONTROL MANIFOLDS

CONTROL SYSTEMS READY FOR OPERATION—NO CIRCUITS TO PONDER OVER AT INSTALLATION

Leading machine manufacturers use these manifolds to cut costs and obtain permanent trouble-free operation. Send your hydraulic circuit print and sketch showing desired take-off connections. We'll prepare a manifold proposal—No obligation.

ALMO TOOL COMPANY
11470 Kaltz—Centerline, Mich.

"Design Wise"

Colonial Broach Co. uses an Almo manifold in this 15 ton capacity, 66" stroke dual-ram broaching machine.

USEFUL LITERATURE

Continued

tentiometer through linkage. Gage pressure is thereby converted into an electrical output which can be used directly in common AC or DC circuits for telemetering, control or remote recording. Typical of the liquids and gases which can be measured are hydraulic fluid, and air. Bulletin 3553, also illustrates absolute pressure and differential pressure potentiometers. Complete specifications and acceleration characteristics are also included.

Circle 239 on Reader Service Card

PROCESS CONTROL INSTRUMENTS . . . are described in catalog 2 released by Fischer & Porter Company. The catalog lists several flow meters, recorders, controllers, pressure regulators, sight flow indicators and chemical feeders. Complete instrument specifications and sizing nomographs for the two common types of flowrator meters, liquid and gas service, are given. Detailed data is given on all of these subjects together with illustrations and prices.

Circle 240 on Reader Service Card

METAL EXPANSION BELLOWS . . . for conveying gas and liquids is described in a six page Bulletin No. 300, issued by Titeflex Inc. With the

COMPACT | DEPENDABLE | EFFICIENT

Double acting Trunnion Mounting BHEW hydraulic cylinder.

BHEW HYDRAULIC CYLINDERS

It's easy and practical to use BHEW hydraulic cylinders in your applications. Accurately honed barrels, hard chrome-plated rods, small O. D. and any type mounting desired are BHEW cylinder features. All types and sizes available in standard and special O. E. M. designs. BHEW makes single and double acting, high and low pressure cylinders with cup-type, ring-type or O-ring construction. Send specifications of your requirements.

BHEW Pressure Operated Hydraulic Flow Control Valves, for lift trucks, eliminate surge as load starts down. Load weight controls rate of descent, full speed raising and empty fork travel. Write for details.

Benton Harbor Engineering Works, Inc.
BENTON HARBOR, MICHIGAN

aid of illustrations, the welded diaphragm construction of the bellows, is pointed out. It is explained that the bellows is able to withstand high temperature, vibration and corrosion. The bulletin also explains how this construction provides flexibility for lines of low internal pressure. The expansion range of this type of bellows depends on the convolutions height. Relatively long expansion ranges can be provided by bellows of rather short initial length. The bellows are available in a variety of metals, Monel, Inconel and stainless to meet varying temperature, vibration and corrosion requirements.

Circle 241 on Reader Service Card

HEAVY FUEL OIL PUMPS . . . which are also used for other non-corrosive viscous liquids, are described in Catalog No. 107, released by Tuthill Pump Company. The pump is a slow speed unit, designed for handling heavy fuel oils in industrial and commercial oil burner service The catalog is well illustrated and all necessary dimensions are shown, together with parts diagrams. Performance data, relationship of speed, capacity, pressure and power consumption are also included. A speed-viscosity chart shows the relationship of pump speed to viscosity of pumpage, plotted on percent of basic speed.

Circle 242 on Reader Service Card

REPUBLIC

VALVES

INDUSTRIAL • CHEMICAL • AIRCRAFT

Remco Check Valves are sturdily built for either 500 psi or 3,000 psi hydraulic service—brass, aluminum alloy, steel, and stainless steel. Pipe, or AN or J.I.C. tube ends, or combinations. Sizes ⅛" to 1".

Manufacturers also of high quality globe, needle, relief, and 2, 3, and 4-way plug valves, and special valves to specifications.

Write for complete catalog and name of nearest distributor. 84

RM REPUBLIC MANUFACTURING CO.

1930 WEST 77TH STREET • CLEVELAND 2, OHIO

Circle 103 on Reader Service Card

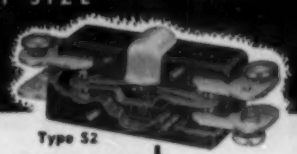
ELECTRO SNAP

snap-action

BASIC SWITCH

offers you three outstanding advantages

- LONG MECHANICAL LIFE
- HIGH CAPACITY
- COMPACT SIZE



Type 52

Cut-away model illustrated.

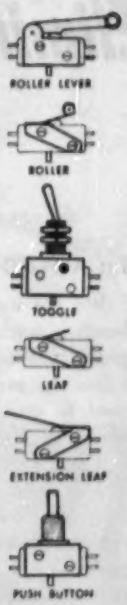
The advantages are *ALL YOURS* . . . with this improved switching component. Over 10,000,000 mechanical operations *plus* precise repeatability, give you unlimited application possibilities. The durable plastic case measures only 1¼" long, ½" wide and ½" high, permitting more compact designs and mounting arrangements.

The positive snap-action of the silver contacts minimizes arcing, assures precision control and renders long electrical operation. The patented, self-aligning springs provide the much desired contact wiping action, seldom found in a switch of this size. The new self-lubricating nylon button provides extremely long life and will directly accept actuator cams up to 45 degrees rise. Rated at 10 amps 125/250 V. ac or 30 V. dc.

To enjoy the *very best* in switching . . . *buy Electro-Snap* for your next application.

Write in today, for detailed specification sheet STF-4.

A few of the standard actuators available.



see our catalog in Product Design File or write for copy

ELECTRO-SNAP SWITCH AND MFG. CO.

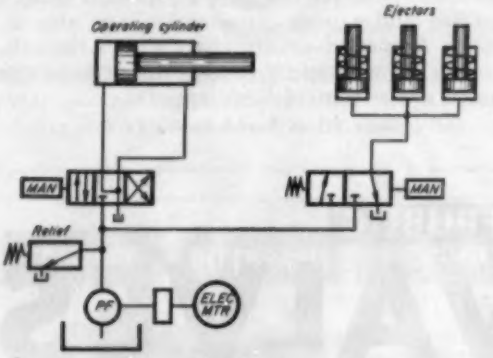
4224 West Lake Street, Chicago 24, Illinois

Circle 43 on Reader Service Card

Problem Clinic

Several months ago we received, from H. H. Ricketts of Dominion Bridge Company, Ltd., Calgary, Alta, Canada, the letter printed here. It tells about the need for a circuit which will eliminate two operating motions. After determining the type of valving needed, it was found that the valving was available as a standard combination valve which greatly simplified the circuit layout and the purchase of components.

Proper Valve Selection Eliminates Motions



1. Original Circuit

To: APPLIED HYDRAULICS Magazine

We are using two 4-way valves to control a rod-bending machine, as shown in the attached circuit diagram, and wonder if you can advise us relating to the following problem. As now arranged, one valve is used to operate the double-acting working cylinder, while the other is partially blanked off to operate as a 3-way valve, operating the ejectors.

The valves are of the "X center" type, the pressure line, in the neutral position, being connected to the return line and the cylinders blanked off. Without going into too great detail, it is sufficient to say that it is now necessary to "jog" the operating cylinder back about ½ inch at the end of the stroke, so as to reduce the grip of the bending dies, on the rod being bent, sufficiently to permit the ejectors to operate.

In addition, after ejecting, the ejector valve lever has to be moved to the opposite position and held there until the ejectors return to their normal position under spring pressure.

We have considered the possibility of eliminating these two lost motions by modifying the valves to operate as "open-centered" types, i.e. with the cylinders and pressure line all connected to the return line in the neutral position. In this way, the ejectors would be free to drop back on release of the appropriate lever and the operating cylinder would move sufficiently, under the spring of the rods being bent, to reduce the grip on them sufficiently for them to be ejected.

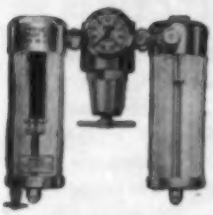
The following difficulties immediately present themselves:

1. With the valves series connected, immediately as the ejectors come into operation, pressure would build up, via the operating cylinder valve, in the ends of the operating cylinder, which would be caused to move due to the difference in areas of the two ends.
2. It is possible that there is sufficient back pressure in the return (low pressure) line to prevent the ejectors from retracting. 20 or 30 psi would be sufficient to prevent retraction.

Circle 81 on Reader Service Card

Prominent User Acclaims

"M-B" Automatic Air Line FILTER, REGULATOR and LUBRICATOR Assembly



The value of "M-B" Automatic Air Line Filters, Regulators and Lubricators is widely known for their effectiveness as a protection to Air Valves, Cylinders, Pneumatic Tools, etc.

"Your 'Sentinel of the Air Line' has been giving us very good service. We have had no complaints at all and I trust that we will be ordering more of them in the near future."

signed: **A. E. Cranston, Sr.**
PRESIDENT

Cranston Steel Strapping Co.
Oak Grove, Oregon

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MULTI-CONTROL VALVE

Capacity 24 GPM
Max. Pressure 1250 PSI
Parallel Application

Model V P

Another Gresen Engineering Triumph in Quality Hydraulics

For Mobile and General Industrial Applications.

FEATURES - - -

- **Fully Balanced—Self Centering—Built-in Adjustable Relief Valve.**
- **Relief Valve Has Replaceable Hardened Seat**
- **Triped Mounting Feet**
- **Check Valve Effective On All Spools**
- **Smooth Positive Easy Control**
- **Hardened and Chrome Plated Spools**
- **Two Position Control Handle 180°**

Center sections are available making additional Controls in this Multi-unit.

Write for full details about this better built, money saving valve.

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present

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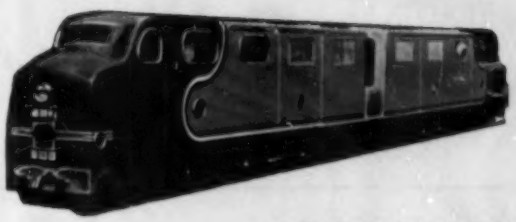

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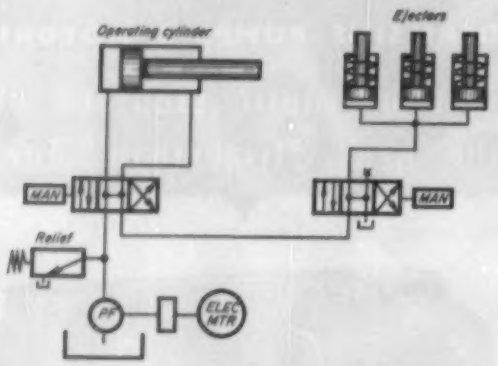
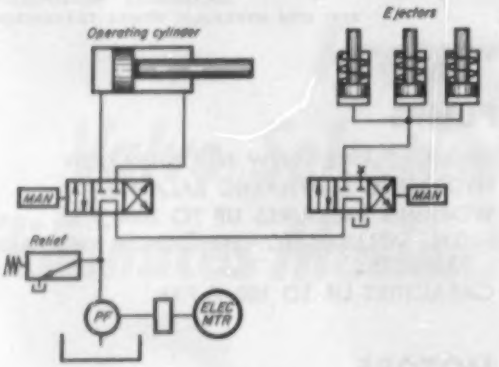
Problem Clinic



2. Open Center Series Circuit



3. Parallel Circuit

3. If the valves were parallel connected, one would tend to by-pass the other unless both were operated at once.

The only solution which appears feasible to us at present, is to use two valves, parallel-connected, modified in such a way that in the neutral position the pressure is blanked off, but the cylinder ends are connected to the return line. An unloading relief valve would, of course, be required in the circuit.

We should appreciate your advice as to the feasibility of this arrangement or suggestions as to any alternative set-up you would recommend.

To: H. H. Ricketts

We've sketched your present circuit, the proposed open center series circuit and the parallel circuit. The sketches use J.I.C. symbols, which simply show the flow conditions through the valves.

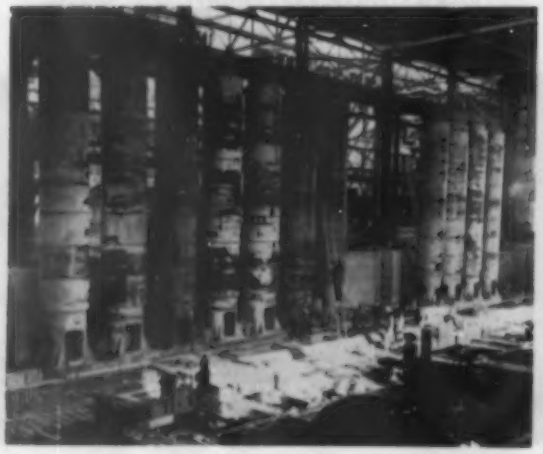
Your analysis is quite correct. For the reasons you point out, circuit 2 using open center valves connected in series won't work.

Circuit 3 is the solution you discuss last and it is probably the most practical. Two new valves are required: a three position, 4-way valve to the operating cylinder with porting as shown; and a two position, 3-way spring offset valve to the ejectors.

The problem of back pressure, which you point out could make the ejectors inoperative, still exists. To eliminate this possibility, the return line should be large and free of restrictions.

To: APPLIED HYDRAULICS Magazine

Checking with the manufacturer of the valves we were using, we found that they are able to provide us with a valve which combines the functions of the valves shown in circuit 3. This valve is a compound unit with parallel flow and spools which open all cylinder posts to exhaust in the neutral position. This valve also includes a built-in relief valve. Use of the valve simplifies the piping, and as we set out to do, it eliminates the two lost motions.



ELEVEN GIANT ACCUMULATORS charged to a water pressure of 4500 psi power new 50,000 and 35,000 ton forging presses. Being built by Loewy-Hydropress for the USAF, each press has seven reciprocating pumps totaling 10,500 hp. The installation is being made at the Wyman-Gordon Company in Worcester, Massachusetts.

Circle 84 on Reader Service Card

MODERN *air fluid* POWER

ASTE SHOW

APRIL 26-29
CONVENTION HALL, PHILADELPHIA
SEE MODERNAIR BOOTH NO. 832

SPECIAL DISPLAY NEWLY DESIGNED

Subplate Mounted Valves,
Completely New Co-axial Type
Air Hydraulic Cylinders,
Air Return Type Single Acting
Cylinders And Package Units
Containing Safety Circuit And
Control For Punch Presses

CYLINDERS
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All components required for complete automatic and sequence circuits:

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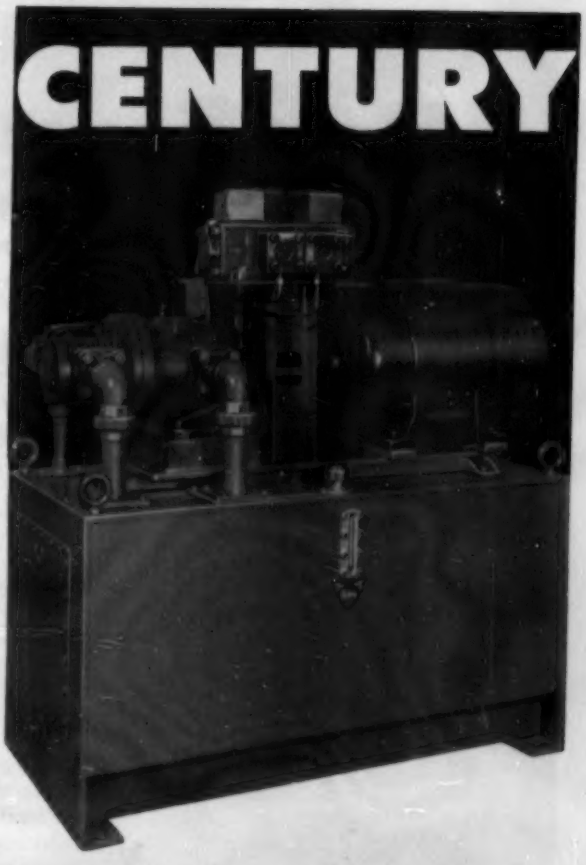
CENTURY



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Designed and Built by Century with—

- 125 Gal. Standard Century Reservoir
- 20 HP Motor
- Vicker's Double Pump
  55 gal. cap. low pressure pump
  26 gal. cap. high pressure pump
  ... relief and unloading valves are included in the circuit
- 2" Vicker's 4-Way Valve

NOTE: This unit designed and built for use with non-inflammable oil

A slight modification could be just the answer to your needs!

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SIZES: 20" focal lgth. 1½ power — 14" focal lgth., 1¾ power, 10" focal lgth., 2½ power; 8" focal lgth., 2¾ power . . . . . price each ONLY **10.50**

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See our complete line. Pullers for Gears, Bearings, Wheels, Pulleys, Bushings, Shafts, etc.

NEW 10 TON HYDRAULIC PRESS

SIZE: 60" high, 27" wide, 29" base

Use this Press in the Shop or take it with you on the job. Frame is 4" welded channel iron. Has 4½" stroke, 2½" diam. ram. Valve operates piston in both directions. Adjustable platform. Positive power Hand Pump with handle. 2500 PSI pressure gauge. **129.00**

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SPECIAL

Gives 20,000 lb. thrust using 1000 PSI line pressure as obtained from our hydraulic pumps. Will produce up to 40,000 lb. thrust with 3000 PSI. Can also be used on a low pressure 60PSI aero air system. Has 4" bore; 18" stroke; 30½" long. Ideal for shop. Part No. 29 NEW **29.95** **43.95**

HYDRAULIC HAND PUMP

Operating pressure 1500 PSI. Cap., 1.5 cu. in per complete cycle . . . **12.75**

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A—20 FLOATING PISTON TYPE — 4"x 10" Built to stand 2,000 PSI **12.75**

A—5 VICKERS — 10" dia. Ball type. Built to stand 2000 P.S.i. **24.50**

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Post Scripts of Industry

News about people, manufacturers and sales orgnizations

Tom Cook
Graton & Knight Company

Tom Cook has been named sales representative of the Texas-Oklahoma area by the **Graton & Knight Company.** He succeeds his father, Harold Cook, who was with the company for 38 years as sales representative in the Texas area. He will operate out of the Dallas office, selling the company's line. Tom Cook was formerly sales manager of the Ben Griffin Truck Center in Dallas.

Lester J. Henderson
The Weatherhead Company

Appointment of **Thomas H. Brumagin** as chief engineer of the **Ajax Flexible Coupling Co., Inc.,** is announced by William T. Welch, president. Brumagin has been associated with the company in the engineering department for seven years.

Wilbur E. Combs has been appointed assistant manager of sales development in the mechanical goods division of the **United States Rubber Co.** Combs who has been affiliated with the rubber company in various sales positions since 1945 will be in charge of development and production of programs to be used by field sales organizations of the division. Prior to this appointment he had served as merchandising manager of New York Belting and Packing Co.

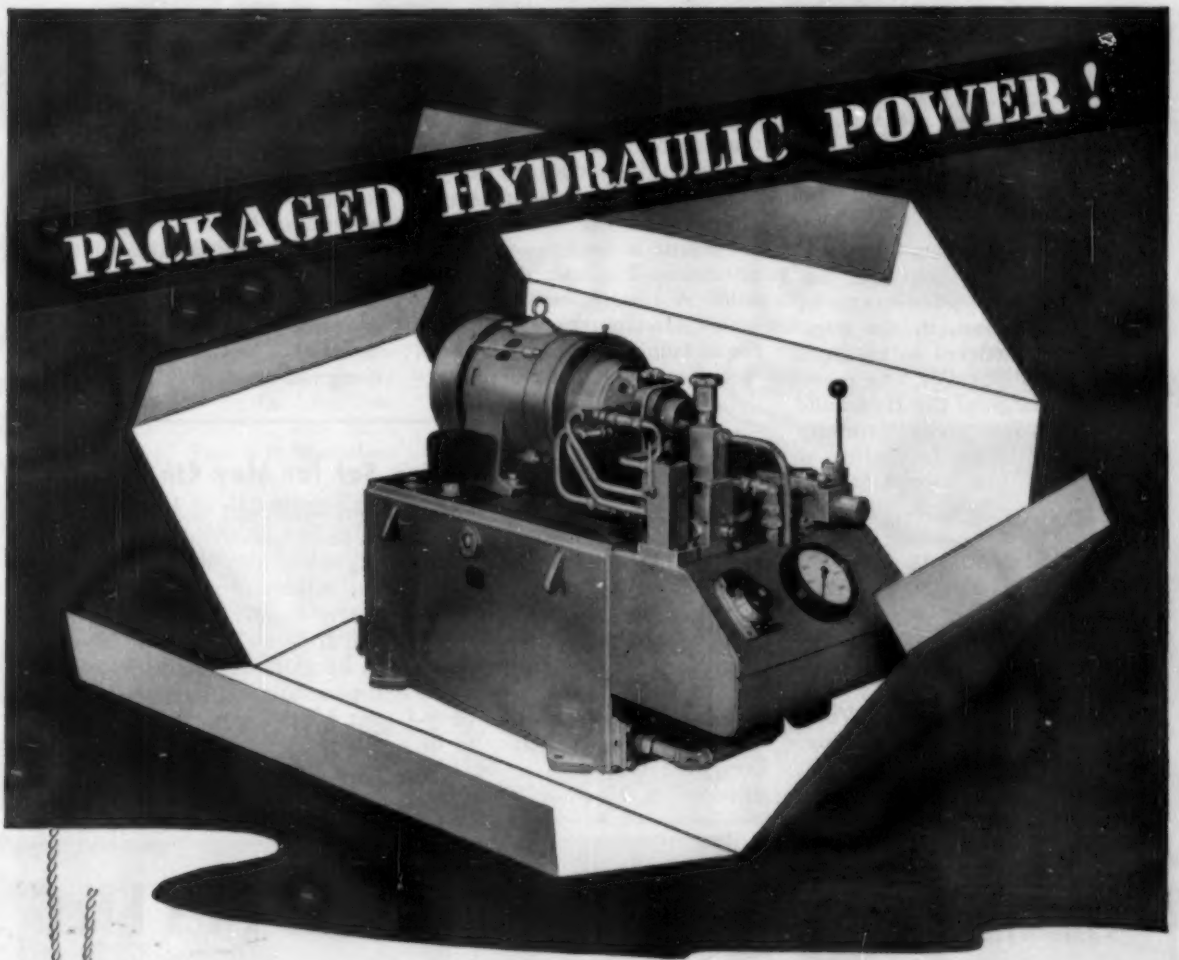
Thomas H. Brumagin
Ajax Flexible Coupling Co.

Albert J. Weatherhead, Jr., president of **The Weatherhead Company,** Cleveland, Ohio, announces the appointment of **Lester J. Henderson** as sales manager of the newly created Industrial Division. In this capacity, he will direct selling activity for their line of industrial products. The new division is the result of a plan which has been an entire year in the making and features a greatly expanded engineering service program. In 1950, Henderson was named sales manager of the Aviation Division, a position he retains in addition to his new responsibilities. He is well known in the Aviation Section of the Society of Automotive Engineers.

Eugene J. LaPorte, salesman for the **Cleco Division** of **Reed Roller Bit Company** in the north central sales division, has recently been appointed assistant to the sales division manager in Cleco's Chicago office. It was announced by V. E. Dolan, sales division manager. LaPorte has served as salesman for the portable air tool firm. It was also announced that **J. T. Roberts** senior salesman for the company in the Kansas City area, will be transferred to Chicago to replace LaPorte as salesman there.

Rowe Methods Inc., Cleveland, has been appointed exclusive distributors in northeastern Ohio by the Mult-A-Frame Division, Ainsworth Manufacturing Corp., Detroit. This announcement was made by C. W. Choromanski, executive vice president of the Cleveland concern. **Paul DuBois,** Rowe's Assistant chief engineer, will direct the new distributing activities. In addition Choro-

PACKAGED HYDRAULIC POWER!



This compact unit, comprising 'Electraulic' axial plunger pump and motor, control valves and oil supply tank, is supplied complete and ready for installation. Just bolt down and couple up three pipes! The unit illustrated develops 15 H.P. at 7000 p.s.i., and is arranged to control the speed and direction of all operations.

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HIGH SPEED PUMPS
DIRECT HYDRAULIC SYSTEM

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MACMILLIN ENGINEERING CORPORATION

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manski announced the appointment of **Lawrence Cotton** as an assistant to DuBois.

Double A Products Company, Manchester, Michigan, announces the appointment of **Charles E. Finn,** in the engineering department as assistant to John J. Pippenger, vice president in charge of the Hydraulic Division. Finn was formerly with the Berry Division of Oliver Iron and Steel Corp.

Herschel V. Hiatt, formerly assistant chief engineer for the Allison Division of General Motors, has been named director of engineering for the **Milwaukee Division** of **Le Roi Company,** a subsidiary of **Westinghouse Air Brake Company.** This was announced by T. O. Liebscher, president of Le Roi.

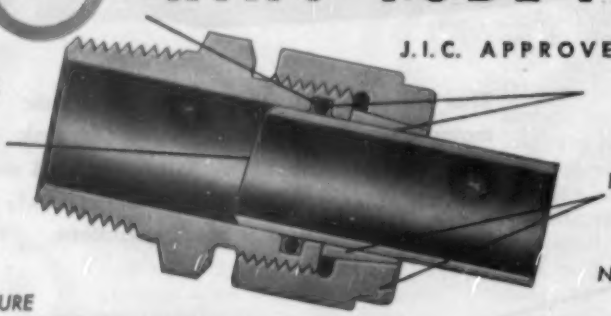
J. Carter Miller, president of **Carter Controls, Inc.,** has announced the establishment of the Carter Achievement Awards for excellence in hydraulic and pneumatic cylinder design applications. The awards will be made to authors of papers which demonstrate a savings in time, labor or material costs, increase in efficiency, production of better products, savings due to replacement of bulkier, more expensive or less efficient equipment. The awards are open to anyone in industry except employees of Carter Controls, Inc., and members of their immediate families. Entries may be made on or before Dec. 31st, 1954 and award winners will be announced in April, 1955. A judging panel will be selected from recognized authorities. The Carter awards are designed to promote progress in

Technical Meeting Set for May 4th

A meeting of the Fluid Power Sub-Committee of the A.S.M.E. will be held on Tuesday, May 4th, 1954, at 7:30 P.M., in the A.S.M.E. Building, Room 502, 29 West 39th St., New York City. The speaker of the evening will be L. J. Baudis, chief engineer of the Bullard Company. The subject of the paper to be presented is the "Use of Hydraulics in Machine Tool Design" and will definitely prove to be of considerable interest to engineers and designers. Anyone interested may attend.

Mr. Baudis' background at Bullard's includes several years in development of methods and time study and later was assistant to the vice president in charge of manufacturing. Duties later included development engineer and service manager.

the LENZ "O"-RING" TUBE FITTING



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NO METAL TO METAL SEAL

NOT NECESSARY TO CUT TUBE SQUARE

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SEAL AND GRIP ARE SEPARATE

HELD BY FRICTION GRIP OF THESE TWO

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DO YOU KNOW ABOUT LENZ REDUCER COUPLINGS?

Reducer couplings are adapters for standard bodies, making possible line reductions on any leg by use of standard adapters and adapter nuts.

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Excessive wrench torque is unnecessary for seal does not depend upon tightness of the nut. The higher the pressure the tighter the grip. Solve your hydraulic piping problems the easy way . . . with ease of assembly . . . no matching of exact tube lengths . . . simple leakproof connection for the life of the tube.

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the field of hydraulics and pneumatics. They are also intended to reward individual achievement and to provide added incentive for designers. Entrants may write to Carter Achievement Awards, c/o Carter Controls, Inc., 2800 Bernice Road, Lansing, Illinois for an entry blank and full information.

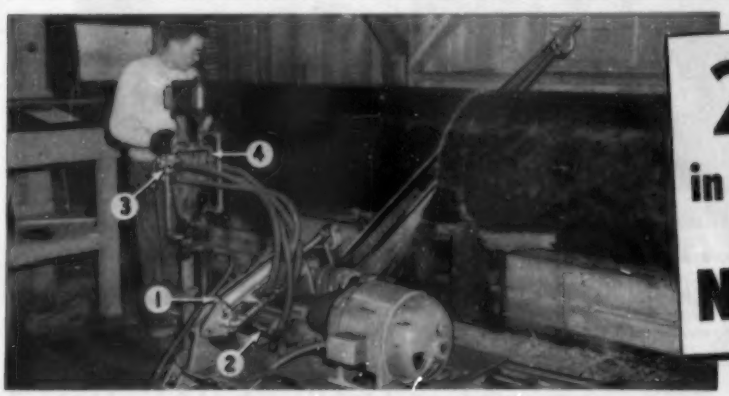
Customers in the Dayton, Ohio area will now have improved service, according to an announcement by D. Lee Bassett, vice president and sales manager of **The S-P Manufacturing Corp.**, Cleveland, Ohio. The **Donald B. Huntting Company**, 7446 Vine St., Cincinnati 16, Ohio, exclusive representatives for S-P, have opened an office at 1904 Brown St., Dayton. Lee Weber of Dayton, is in charge of the new office.

The appointment of **Charles R. Taylor** as manager of sales engineering of the **Berry Division of Oliver Iron and Steel Corporation** was announced by Ara A. Cambere, vice president of sales. Mr. Taylor has developed and patented several devices relating to hydraulic mechanisms, and he will supervise the application of Berry hydraulic motors for industry and commercial installations. Mr. Cambere also announced the appointment of **James W. Wilcock** as general sales manager of the Berry Division. Wilcock will be headquartered in the Oliver Building, Pittsburgh, Pa.

The Rucker Company, west coast manufacturer of fluid power systems, has been appointed western distributor for hydraulic presses produced by **Pasadena Hydraulics, Inc.** The distributionship will cover the six states of California, Arizona, Washington, Oregon, Idaho and Utah. The company with headquarters in Oakland, Cal., maintains offices in South Gate, Cal. and Seattle, Washington.

James W. Wilcock
Berry Division
Oliver Iron & Steel Corp.

Charles R. Taylor
Berry Division
Oliver Iron & Steel Corp.



2 Vital Movements in Deck Saw Operation
Powered by
NOPAK Cylinders

This carriage-type deck saw, designed and built by Elk Lumber Co. Medford, Ore., eliminates mis-cutting, and short logs reaching the carriage.

The 8 foot chain-saw bar is raised and lowered by a NOPAK Model E, 6" x 14" Air Cylinder. Horizontal carriage movement of 10", powered by a NOPAK 4"x10" Air Cylinder, permits operator to locate saw accurately to cut logs within minimum tolerance of ½". Both movements are controlled by NOPAK valves mounted at operator's station.

This is typical of hundreds of machine movements in which NOPAK Cylinders and Valves are used in all types of industry. For others, see the NOPAK Application Manual.

Arrow No. 1 — NOPAK 6"x14" Model E Cylinder
Arrow No. 2 — NOPAK 4"x10" Model E Cylinder
Arrow No. 3 and No. 4—NOPAK ½" 4-Way Valve

•

Refer to Sweet's File for Product Designers or write for Bulletin SW-2.

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VALVES AND CYLINDERS
DESIGNED for AIR and HYDRAULIC SERVICE
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Specialists in carbide and high speed steel cutting tools

Post Scripts of Industry

Tom L. Parker, vice president, sales, **Columbia Steel & Shafting Company,** in Pittsburgh, Pa. has announced the appointment of **Jules K. Egerman** as district manager of sales for the Dayton-Cincinnati territory, with headquarters in Dayton. Egerman will replace E. L. Gray. Mr. Egerman has had many years of experience in the steel industry.

Jules K. Egerman
Columbia Steel & Shafting Co.

Brig. Gen. Joseph T. Morris, U.S.A.F. retired, has been named assistant vice president of **United Aircraft Products, Inc.** of Dayton, Ohio. Morris was selected by the corporation's board of directors recently to work closely with Edward L. Ladd, executive vice president and general manager of UAP and will maintain offices in the Dayton plant. The General, who retired last August after 35 years active duty, is known throughout the military and

Joseph T. Morris
United Aircraft Products, Inc.

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TO MEET ALL SIZE AND PRESSURE REQUIREMENTS

8½-in. bore by 36-ft. stroke cylinder built by Lincoln for steel-mill equipment applications.

2-stage 5000-psi cylinder built by Lincoln for cold-extrusion press. Dimensions: 20-in. bore by 19-in. stroke, and 4-in. bore by 19-in. stroke.

BORES TO 36 IN. DIAMETER
STROKES OF 50 FT. AND LONGER

LINCOLN MACHINE COMPANY will design, engineer and build standard or special hydraulic and pneumatic cylinders with trunion, rod-end flange, blank-end flange, foot, clevis or center-line mountings.

Call on LINCOLN when you require large, powerful rotating or non-rotating hydraulic cylinders, heavy-duty mill-type cylinders, or standard hydraulic and pneumatic cylinders. Our engineering department will give you fast, practical assistance in design problems . . . AND our modern plant will build your cylinders quickly and economically.

WRITE TODAY FOR LINCOLN'S CATALOG. It gives engineering data on many types and sizes of heavy-duty cylinders.

LINCOLN MACHINE CO. INC.
326 WEST 2nd STREET • SALEM, OHIO

airflight world for his service as Commanding General of Wright-Patterson Air Force Base from June of 1945 to April of 1952.

Donald P. Berg has been promoted to senior project designer at Designers for Industry, Inc., Cleveland, independent engineering organization. Berg joined the company in 1952 as project designer on the mechanical engineering staff.

The Hammel-Dahl Company of Providence, R. I. manufacturers of automatic control equipment announces the appointment of the **James S. Kone and Company** as new sales representatives. James S. Kone and Company, Amarillo, Texas, will represent Hammel-Dahl Company in Texas, Oklahoma and Kansas.

Edmond C. Falleur
Belgian Electric Sales Corp.

Belgian Electric Sales Corp. announces the appointment of **Edmond C. Falleur** to the post of chief technical engineer. Falleur, former chief service engineer of Ateliers de Construction Electrique de Charleroi, was in charge of the major test bank at Charleroi. In his new post he will advise on all technical matters relating to the complete line of ACEC motors.

Emmett Machine & Mfg., Inc., announce the appointment of **Jerome B. McMahon** as representative in the metropolitan Chicago area including northern Illinois, southern Wisconsin and northwest Indiana. McMahon's background is in automatic control with Republic Flow Meter Co. He is a past president of the Instrument Society of America. Offices have been opened at 122 South Michigan Ave., Chicago 3, Illinois.

A. K. Allen Company has announced that the **Rucker Company** has been appointed an exclusive distributor of dial feed tables and cylinders in the states of California, Arizona, Idaho, Nevada, Oregon and Washington.

Aaron B. Bagsar, chief metallurgical engineer of **Sun Oil Co.** retired February 1st, after 22 years of service. Succeeding to the position Dr. Bagsar vacates will be **Joseph E. Carney,** assistant chief metallurgical engineer. Bagsar joined the company in 1932 and has served in his present capacity since that time, Carney joined the company in

BOOST PUMPS

Measures 8¼" wide x 9⅝" deep.

Boost 100 PSI. air pressure to 10,000 PSI. fluid pressure for $173.25 (FOB Gardena, Calif.). Eight standard models for output fluid pressures of 1,000 to 30,000 PSI. Special models for lower or higher pressures.

Applicable wherever low volume output at high pressures is the requirement. For oil or water service. Complete power packages also available. Send for bulletins.

Assembly No.	Ratio	Maximum Fluid Pressure	Prices, F.O.B. Gardena, Calif.
216-C- 10	10:1	1,000 PSI.	$220.00
216-C- 20	20:1	2,000 PSI.	210.00
216-C- 35	35:1	3,500 PSI.	173.25
216-C- 60	60:1	6,000 PSI.	173.25
216-C-100	100:1	10,000 PSI.	173.25
216-C-150	150:1	15,000 PSI.	194.50
216-C-200	200:1	20,000 PSI.	225.00
216-C-300	300:1	30,000 PSI.	289.50

SPRAGUE
Engineering and Sales Corp.
1144 West 135th Street, Gardena, California

1934 and in 1951 was appointed assistant chief metallurgical engineer.

According to an announcement by W. H. Faeth, president of **The Bristol Company**, Waterbury, Conn., **John G. Fleming** has been appointed to the newly created position of product planning manager. This arrangement is intended to provide a more concentrated and directed approach to the company's short term and long range planning of new and improved instrumentation.

The Electro Dynamic Division, General Dynamics Corp., has named **Mark L. Lane** to the post of New York district manager, has been announced by Dean W. Paul, sales manager. He has served as sales engineer in the electric motor field throughout the eastern part of the United States. His sales service also includes construction work.

Mark L. Lane
The Electro Dynamic Div., General Dynamics Corp.

James J. Anderson
National Pneumatic Co., Inc.

National Pneumatic Co., Inc., and **Holtzer-Cabot Divisions**, Boston, Mass., announces the appointment of **James J. Anderson** as general manager. Anderson will be in charge of sales for the following company divisions: Holtzer-Cabot Telephone Equipment, Holtzer-Cabot Motor, Government Contracts, Transit and Railroad, Industrial Actuators and Controls, Automatic Door, and International Sales. In addition he will be responsible for the company's advertising and sales service divisions.

John J. Bress has joined the product planning department of the **Chemical Division** of **Cela-**

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Foot Valves

Instant action of remotely located or automatically operated cylinders is made possible with the new and improved Ledeen Power Operated Valves. These disc-type valves are positive in operation, and are readily adaptable to a wide variety of pilot controls. Solenoid operated power valves are available as complete package units.

Ledeen Power Operated Valves are fast cycling, have few moving parts, and require very little maintenance. They are available from stock for quick delivery.

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PUMPS & BOOSTERS

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nese Corp. of America as technical service engineer. He is attached to the application laboratory of the Division at Summit, New Jersey. Before joining the company Bress was with Atlas Powder Co.

Hydropress, Inc., and its Loewy Rolling Mill Division, have appointed **Harold C. Sproule,** district sales engineer, covering Michigan, Wisconsin and the northern parts of Illinois, Indiana and Ohio, with headquarters at Chicago and Detroit. Sproule has had over twenty years experience in the design, erection and sales of hydraulic press equipment and metalworking machinery. He succeeds Roland Higgins.

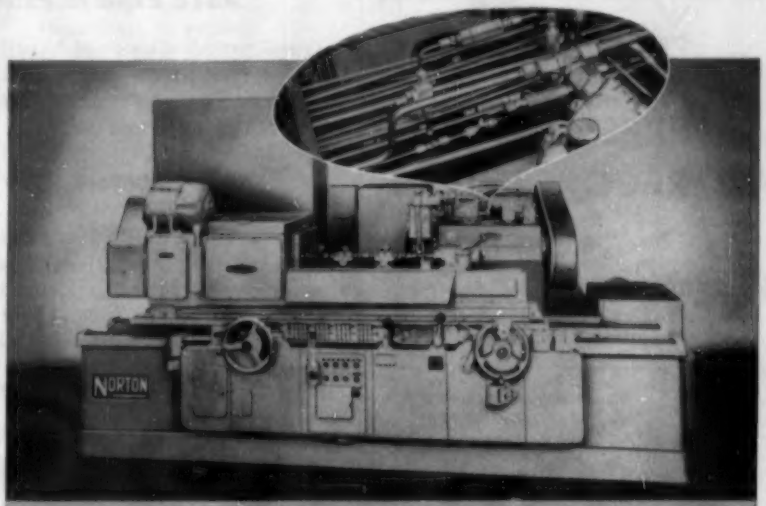
David Fromson
The National Security Industrial Association

James G. Duffy
Greer Hydraulics, Inc.

The National Security Industrial Association has announced the appointment of **David Fromson,** to its procurement advisory committee. Fromson is contracts manager and executive assistant to secretary-treasurer Robert P. Lord of Greer Hydraulics. A civilian organization bringing together the employers of more than ⅓ of the nation's manufacturing force, the NSIA acts as liaison between industry and the Department of Defense.

Greer Hydraulics, Inc., announces the appointment of **James G. Duffy** as group engineer in their Research and Development Center. Mr. Duffy's extensive experience in the instrument and atomic energy fields includes five years as methods engineer for the Sperry Gyroscope Corp.

Nine new salesmen of **The Hydraulic Press Mfg. Company** recently completed an extensive training course at the home office in Mount Gilead, Ohio. They are **J. Jay Smith** of Glen Ellyn, Ill., Chicago office; **Ray W. Arnesen** of East Rockway, N. Y. Teaneck office: **W. J. McManus** of Demarest, N. J. Teaneck office; **H. R. Chase** of



CAMSHAFT GRINDING—HIGH PRESSURE JOB TAILOR MADE FOR SUPERIOR HYDRAULIC TUBING

One reason why Detroit can turn out cars in such huge numbers is their use of new machine tools which, until a few years ago, were just a gleam in a designer's eye. Good example is the Cam-O-Matic* . . . a high speed, fully automatic camshaft grinder developed by the Norton Company of Worcester, Mass.

The Cam-O-Matic has a highly complex hydraulic system for holding and positioning work, controlled by an electronic brain which times the sequences of operation. To make this tubing network as failure-free as possible, Norton engineers selected Superior carbon steel hydraulic tubing as a standard component. They knew from experience that Superior *higher-than-industry-quality* tubing can take (1) the punishment of vibration; (2) the high pressures put out by modern hydraulic circulating systems; (3) the severe flaring and bending necessary in assembly. As a result, machine down-time due to tubing failure has been eliminated.

If you use hydraulic tubing and your specifications demand exact analysis, unusual fabricating ease and dimensions that are precise—specify Superior. Mail this coupon today for Bulletin 38, Catalog Section 30 and the name of your nearest distributor.

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Pressures which vary widely and rapidly can now be measured with sustained high precision. The new Foxboro Heavy Duty Helical Element (illustrated) also permits high scale expansion, and provides high over-range protection. It is available in full- or expanded-scale ranges between 0-50 psig and 0-80,000 psig. Type 316 Stainless Steel construction gives best practical resistance to corrosion.

Diaphragm, spiral, helical, bourdon, and bellows-type elements, of phosphor bronze, beryllium copper, Ni-Span alloy, or Type 316 Stainless Steel, make the Foxboro line of Indicating, Recording, Controlling, and Transmitting Pressure Instruments the most complete available. Round or rectangular cases. For specific information on your problem, write **The Foxboro Company, 214 Norfolk Street, Foxboro, Mass., U.S.A.**

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Post Scripts of Industry

Batavia, N. Y., Pittsburgh office; **Elton W. Turner** of East Detroit, Mich., Detroit office; **B. H. Lowe** of Battle Creek, Mich., Detroit office; **Ray L. Moreland** of Millcreek, Pa., Pittsburgh office; **Joseph H. Ondras** of Chicago, Chicago office; and **K. V. Keidel** of Cleveland, Ohio, Mount Gilead office.

Eric R. Behn has been appointed as staff assistant to the manager of the electronics department at **The W. L. Maxson Corp.**, New York. He will handle technical phases of sub-contracts. Before joining the company, Behn was a project supervisor with Walter Dorwin Teague Associates.

ASTE Expo In Philadelphia April 26-30

During the week of April 26th, engineers from throughout the country will attend the American Society of Tool Engineers' Industrial Exposition and 22nd Annual Meeting in Philadelphia.

Nearly 500 companies will have exhibits in the Philadelphia Convention Center. Exposition visitors wanting to learn about products used on hydraulic and pneumatically powered machines will want to stop at the following exhibits:

Air Conversion Research Corporation	1251
APPLIED HYDRAULICS Magazine	2160
Beckett-Harcum Company	1054
Carter Controls, Inc.	512
The Denison Engineering Co.	1400
Doerr Electric Corporation	1955
Galland-Henning Manufacturing Company	817
Hanna Engineering Works	1417
Hannifin Corporation	827
Hansen Mfg. Company	1352
Honan-Crane Company	1438
E. F. Houghton & Co.	1743
The Hydraulic Power Division, Hydraulic Press Mfg. Co.	1212
Lindberg Engineering Company	1231
Logan Engineering Co.	908
Logansport Machine Co., Inc.	1550
M-B Products	1439
Mead Specialties Company, Inc.	1907
Micro Switch A Div. of Minneapolis-Honeywell Regulator Co.	1708
Miller Fluid Power Company	1360
Modernair Corporation	832
New York Airbrake Company	1226
New York Belting & Packing Co.	111
Ortman-Miller Machine Co., Inc.	612
Racine Hydraulics & Machinery, Inc.	600
Reliant Industries	326
Rivett Lathe & Grinder Inc.	1854
Ross Operating Valve Company	800
The S-P Manufacturing Corporation	806
A. Schrader's Son Div. Scovill Manufacturing Co. Inc.	723
The Skinner Chuck Company	1808
Socony-Vacuum Oil Co., Inc.	1327
Standard Pressed Steel Co.	1539
The Texas Company	831
Tide Water Associated Oil Company	1712
The Tomkins Johnson Company	1247
The Torrington Company	967
Valvair Corporation	2116
Vickers Incorporated	705
Wales-Strippit Corporation	1830
The Weatherhead Company	1339

Throughout the week, a total of 32 technical meetings will be held. Among the papers delivered at these meetings will be discussions on the application of fluid power to transfer machines, forming equipment, workholding devices and machine tools.

The Market Place

Classified Ad Rates
Rate for "Positions Wanted" ads is $5.00 per column inch. For all other classifications, $20.00 for the first column inch and $15.00 for each additional inch.

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Factory representatives for the provinces of British Columbia, Alberta, Manitoba, Ontario and Quebec on commission basis required by British manufacturer who has developed and proved in the U.K. a new type of moulded packing and for which patents are pending in Canada and U.S.A. Suitable ancillary line for persons having established connections particularly in hydraulic engineering. Particulars to Box 4154 APPLIED HYDRAULICS.

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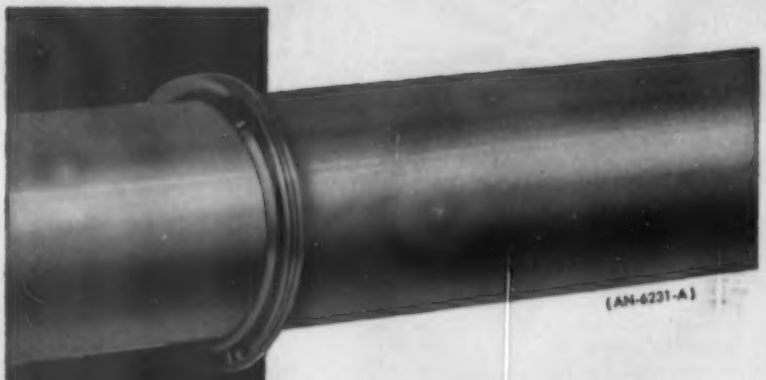

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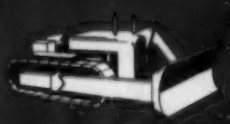

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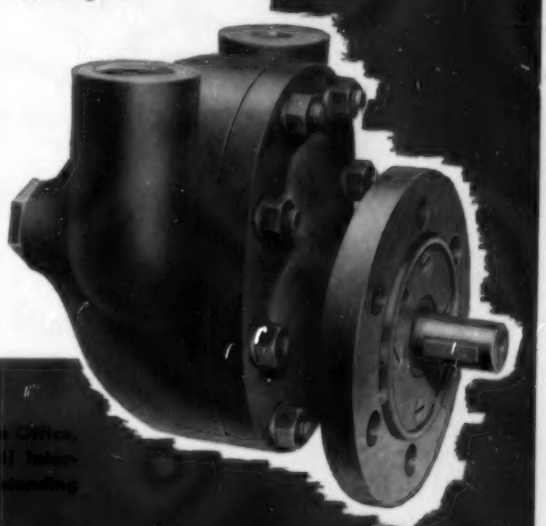

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POWER supplied by a 5 horsepower d.c. motor driven hydraulic pump package propels a 13 ton fixture and its 4 ton workpiece through milling, drilling, reaming and tapping operations. The 13 ton holding fixture is a shuttle car complete with its drive unit and positioning cylinders which runs on tracks and takes its power from a third rail.

Built by Wean Equipment Corporation, the three station transfer machine being used at the Massey-Harris Co. plant in Racine, Wisconsin, machines the drive suspension pads on the hull of a gun carrier. The cars travel in a straight line for 150 feet between the load and unload positions. Selection of hydraulic power to move the shuttle car was made because of weight and space requirements and also because oil power had to be available to locate the heavy fixture.

The hydraulic power package, which includes an 8 gpm, 1000 psi pump, reservoir, relief valve and two manually controlled four-way valves, weighs only about 55 pounds without its gallon capacity of oil and has overall dimensions of approximately 12 x 8 x 12 inches. In neutral, the four-way valves are spring centered to block the cylinder ports and circulate oil between the pump and reservoir. One control valve directs oil to the fluid motor which drives the car. The other valve controls the operation of the car's lift cylinders.

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